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WHEN COMMON SENSE FAILS: PUBLIC DEBATE OVER WATERSHED MANAGEMENT IN BRITISH COLUMBIA - A CASE STUDY

Author: Alan Etkin

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Date 30 November 1994
The intensity of environmental conflicts in British Columbia continues to increase as a greater number of demands are being placed on diminishing natural resources. Throughout the province, numerous interest groups and industries are at odds with one another. Further complicating the issue is a financial and political dependence on a system which measures the liquidation of natural resources as an economic gain. Of all the conflicts in British Columbia, those surrounding forestry, the province's largest industry, are the most politically charged.

Adopting a case study approach, this thesis examines the debates surrounding the Greater Vancouver Regional District (GVRD) watershed management to explore why a substantive challenge to industry defined science failed to influence government policy. This study employs discourse analysis of three competing framings of these debates about watershed management science: 1) within the policy and management process; 2) in arguments made in a public participation process; and 3) in the media's coverage of watershed management issues.

The case study consists of two parts. A historical review of the factors influencing British Columbia's approach to watershed management is based on documentary research. This history provides the context necessary for interpreting the debates in the recent period. A more focused study on the controversy in the period between 1988 and 1992 uses primary sources including interviews, personal observation of meetings and documentary research. A careful reading was made of the Vancouver Sun and the Province newspapers' coverage of watershed management issues to assess how this controversy was presented to the public.
The historical analysis reveals how the forest industry has influenced watershed management policy, legislation and science. The contemporary case study shows that in spite of increasing environmental concern, and in spite of a public participation process, critical and informed scientific arguments did not change management policies. Moreover, the media relied on the official version of watershed management and failed--with few exceptions--to report on these critical arguments. This study suggests that though our society requires a broader dissemination of scientific controversies for improved risk management, without better reporting of the science, it will be difficult to create informed consent.
All the literature shows that in fact the natural forest in most cases produces the highest quality water. ...As you eliminate those forests, the quality of water would be increasingly at risk, although you might well be able to carry out most forestry practices without what you would call a significant reduction in water quality. So this is not a yes or no issue. It has to do with probabilities and it has to do with increments of change. ...Obviously the best risk for the watershed in terms of water quality is not to cut at all. But that can cost you a hell of lot of timber resource sometime, so you look for a middle ground. ...How much decrease in water quality or how much risk to water quality is a half a billion board feet of timber worth? Now that's a call your society is going to have to make.

(Franklin 1990, 22-3).
ACKNOWLEDGMENTS

As with many projects of this scope and volume, a great number of people have contributed information, ideas, guidance, support and patience during the process. To all those interviewed, I am grateful for the information and insights provided. I am particularly indebted to Will Koop for sharing his research into the history of the watersheds. At the University I offer thanks to my colleagues--for the stimulating discussions, and to my supervisor and committee members--for getting me out the door. To my family, their acceptance and support of my student status have been invaluable. To the memory of my father, I dedicate this research. To Adrian, I thank you for letting me win our race. And finally, the patience and emotional support offered by my partner throughout a difficult process is a contribution beyond measure. Thank you Fabienne.
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CHAPTER I.
A CASE STUDY OF WATERSHED MANAGEMENT IN BRITISH COLUMBIA

1.1 INTRODUCTION

The intensity of environmental conflicts in British Columbia continues to increase as a greater number of demands are being placed on diminishing natural resources. Throughout the province, numerous interest groups and industries are at odds with one another. Further complicating the issue is a financial and political dependence on a system which measures the liquidation of natural resources as an economic gain. Of all the conflicts in the province, those surrounding forestry are the most politically charged. The industry, with manufactured products worth $13.8 billion dollars in 1993, is the province’s largest economic player (Statistics Canada, 1994). As such, it has exerted considerable political influence, resulting in both policy and legislation favouring the financial interests of the major forest corporations. This is fully in keeping with theories about environmental conflict which equate economic power with political influence (Paehlke and Torgerson 1990). This study takes the case of conflict over the definition of good watershed management to illustrate how the forest industry influences the provision of quality drinking water throughout British Columbia.

1.2 BACKGROUND

British Columbia is one of the last jurisdictions in the world with an abundance of uncontaminated fresh water in surface watersheds suitable for drinking without extensive treatment. The mountainous topography of the province and its proximity to the Pacific ocean combine to provide ample
rainfall, replenishing snowpack, rivers, lakes and underground aquifers. The topography has also resulted in a wide variety of biogeoclimatic zones, many of which are characterized by rich forest growth. The abundance of this natural wealth has been central to the development of British Columbia, and, in keeping with the history of European settlement, little thought was given to the conservation of natural resources. The benefit of forestry as an industrial enterprise was quickly realized by both entrepreneurs and government, and since the late 1800’s the forest industry has been logging the seemingly endless stands of douglas fir, hemlock, cedar, spruce and pine. While there has been an ongoing struggle between industry and government to maximize their respective share of the wealth, both share the goal of liquidating forests for profit. With this mutual objective, the forest industry has had a considerable impact on the development of the provincial legislation governing forest management and on the expertise with which the forests are managed: legislation was created to ensure favourable conditions for timber production, and the expertise of forestry focused on the development of industrial practices.

With only a brief history of European settlement, the population of British Columbia is still small in relation to the size of the provincial land base, which accounts for the relatively unspoiled natural environment. This state of the environment is, however, rapidly changing. Technological advances within the industry have led to a greatly increased capacity to log the provincial forests, to the extent that 50 per cent of the total volume logged in British Columbia has been logged over the past 20 years (Travers 1992). As the forest industry moved from valley to valley seeking fibre, the population of the province steadily increased, and more and more communities found their watersheds roaded and logged. With a government interested in maximizing profit from the forest,
legislation was established favouring timber production and not the communities whose watersheds were being denuded.

Justification for the practice of logging in community watersheds was provided by forestry theorists who, based on their models of industrial efficiency, argued that our society would benefit from the multiple usage of watersheds by "cropping" both water and wood fibre. The same theorists, whose ideas were promoted by industry and embraced by government, also claimed that the health of watershed forests could be improved upon by the application of scientific management practices, specifically sustained yield forestry. As numerous degraded watersheds throughout British Columbia attest, the theory did little to protect water quality from the impact of logging. Despite the mounting evidence of degradation in community watersheds throughout the province, the existing legislation and management approach was maintained.

Conflict was the inevitable result. With numerous examples of the destructive impact of logging, and with the increasing volume being logged, the Ministry of Forests, the provincial agency created to ensure the smooth industrial management of the forest resource, and the forest industry were aggressively challenged. During the same period a rise in concern for environmental degradation worldwide was fueling a debate throughout the province about the impact of forestry practices. Concerned citizens began to mobilize political will through lobbying and through highly visible acts of civil disobedience. Beleaguered by the criticism, and by increasing government pressure to reform a system that was degrading both the natural environment and the communities dependent upon it, industry attempted to improve its image through public relation campaigns which they hoped would educate British Columbians about the validity of their management practices.
The debate over watershed management in the Greater Vancouver Regional District (GVRD) embodies the debate over forestry throughout British Columbia, and as such serves as a compelling case study of the structure of forest industry influence. At its root is the way water management issues have been defined by the industry complex. The GVRD is a government agency representing the interests of the various municipalities located in Vancouver region. The GVRD watersheds have been designated under a special legislative act for the sole purpose of providing drinking water, and, theoretically, are not subject to conflicts between the interests of logging and the maintenance of water quality. Yet the Greater Vancouver Water District (GVWD), the organization within the GVRD charged with maintaining the region's water supply is building roads and logging the watershed forests. According to the GVWD the main threats to water quality from the watershed forests are bug infestations killing trees and resultant fires, which would release ash and soil into the water supply. The GVWD believes that replacing the "decadent" old growth forests with "diverse, multi-age stands" of trees will minimize the risk from these threats by creating a "more stable" forest environment, while at the same time providing the economic benefit of logging. The GVWD also believes that a network of roads in the watersheds is essential to fight fires and access debris torrents that threaten the water supply. These forest management activities are based on assumptions guiding industrial forestry, assumptions narrowly focused on the production of quality wood. That such narrow expertise is guiding the management of a watershed providing drinking water for 1.6 million British Columbians, is testament to the influence of the forest industry. It is also what enables this case study to reveal the broader dilemma of watershed management throughout the province.
The forest industry, the Ministry of Forests, the association governing professional foresters, key faculty representing the University of British Columbia's School of Forestry and the union representing woodworkers (organizations which I will refer to collectively as the industry complex throughout the rest of this paper) have adopted the GVWD watershed management program as an example of the contribution forest management can make to both water quality and financial profit. In 1987 the lower reaches of the Seymour Watershed, below the water intake, were designated as the Seymour Demonstration Forest to educate residents of the Greater Vancouver area about the benefits of forest management. The GVRD watershed management program is presented by the industry complex to be the finest example of watershed management and integrated resource management in the province and, as such, is defended with a great degree of emotional commitment and resources. If a decision were to be made to halt the GVRD watershed management program, the industry complex is concerned about the precedent it may set across the province in terms of loss of revenue and, most significantly, loss of authority. At stake is their ability to define forest management issues.

That this conflict exists reveals the underlying economic and political structure that has developed and perpetuated the legislation and policies governing water, while protecting the interests of the most influential industry in the province--forestry. And that this conflict exists in the back yard of the province's largest urban centre reveals the influence the forest industry has had in defining the common good for individuals whose well being has more to do with the quality of their drinking water than the health of the forest industry.

This thesis will argue that despite widespread evidence of the negative consequences of logging on water quality in watersheds throughout the province, the agency mandated to protect the watersheds providing water to the
residents of the GVRD has, with little opposition, adopted and promoted the perspective of industrial forestry, all the while claiming that logging under their management regime has had no negative impact on water quality. This perspective has not always guided the GVWD. In fact, the agency was established to prevent logging in the watersheds, and, for the first 35 years of its existence, succeeded in stopping all such activities. A review of the history of the GVWD and the province's forest policy helps to explain the transformation in watershed management philosophy. It does not, however, explain the lack of concern over such a precious resource.

To understand the lack of concern over watershed management activities, one must examine the means by which most GVRD residents receive information about those activities--through the news media. This thesis will examine newspaper coverage in the Vancouver Sun and the Province, the largest daily newspapers in the British Columbia. During a key stage of the debate over watershed management practices, the Vancouver Sun changed its mandate from reporting province-wide to focusing its attention on regional issues. Given the significance of the issue to both residents of the Vancouver area and the industry complex, one would expect a marked increase in coverage of the issue corresponding with the newspaper's change in mandate, and that the coverage would be more comprehensive. This study found that coverage did increase in volume, but maintained a limited perspective in terms of its criticism of existing management policies and the rationale provided for them. Criticism of the GVWD management program was reported on as primarily coming from one environmental group, while substantive criticism from a number of other sources was overlooked. Issues were generally discussed in terms presented by the GVWD management. These observations led me to question precisely how
the definitions of good watershed management were maintained despite the existence of strong evidence which contradicted the GVWD assertions.

1.3 THESIS OVERVIEW

1.3.1 Purpose and Objectives

This thesis is a discourse analysis of three competing framings of the public issue of watershed management. It shows how one framing—that proposed by intervenors in an official public participation process—is excluded from both management decisions and media coverage of the debate. By using the debate over the Greater Vancouver Regional District (GVRD) watershed management as a case study, a complex relationship between media, the forest industry and watershed management policy in British Columbia is revealed. In order to situate the issue in its larger context, this study provides an overview of the forest industry's influence on the development of British Columbia. Next is a review of watershed management practices and expertise, which is then followed by an examination of public participation in the debate over GVWD watershed management. With the context established, the study examines how news media have reported on the issues.

1.3.2 Methodology and Information Sources

In an attempt to do justice to the complexity of the issues and to serve the need for a rigorous approach to analysis, this study employs case study methodology. Unlike experimental research, which separates the subject of investigation from its context; and unlike historical research, which primarily deals with events of the past; and unlike surveys which have only a limited ability to deal with context, case studies, Yin (1989) argues, are particularly suited
to answering questions which deal with the "how" and "why" of contemporary phenomenon which occur over time. As formally defined by Yin:

*A case study is an empirical study that:
- investigates a contemporary phenomenon within its real life context;
when
- the boundaries between phenomenon and context are not clearly evident; and in which
- multiple sources of evidence are used" (Yin, 1989. 23 emphasis in original).

To establish the context of the debate over watershed management, the primary research conducted for this study utilizes: interviews with participants representing the major interest groups; agenda minutes from GVRD and GVWD meetings; documents from the files of key activists; GVWD commissioned management reports and associated public input documents; media coverage of the issue; and lastly, personal observation of public meetings and a number of significant GVRD Board and Water Committee meetings. For analysis of the news coverage, a careful reading was applied to the *Vancouver Sun* and *The Province* daily newspapers. Watershed management issues were informally categorized and then analyzed for patterns of recurrence. Qualitative analysis was also used to reveal the significance of the way in which key events in the evolution of the management program were either reported on or ignored. Lastly, interviews were conducted with reporters covering the subject.

1.3.3 Organization of Thesis

In addition to the introductory chapter, this thesis consists of six chapters. Chapter Two reviews the economic and political aspects of watershed management, including a review of the legislation governing watersheds. Chapter Three presents an overview of the evolution of watershed management science, paying particular attention GVWD management practices. Chapter Four traces the impact a rise in concern for environmentalism had on the watershed management debate. Chapter Four also details the challenges to watershed management science made in a formal public participation process which took place in 1991. With the case study established, Chapter Five reviews the theory of media coverage of environmental issues, and then details news coverage of the watershed debate. The analysis is found in Chapter Six, followed by conclusions and recommendations in Chapter Seven.
2.1 FORESTRY IN BC

Forestry has a central role in the economy of British Columbia. Approximately 55 per cent of province's 94 million hectares is covered by forests. Of this area, 37%, or 35 million hectares, is considered to be commercially productive with some of the richest forested lands available in North America. An estimated 272,100 individuals are either employed directly or indirectly (CORE, 1991) by an industry which manufactured $13.8 billion worth of forest products in 1993 alone (Statistics Canada, 1994). In 1993, 79 million cubic metres of wood was cut by British Columbia's forest industry (British Columbia, 1994). For every 1,000 of those cubic metres, approximately $19,000 is added to the provincial government's revenues through royalties and taxes (M'Gonigle and Parfitt, 1994, p. 45). Along with the industry's economic contribution is a considerable influence on the political priorities of the provincial governments. In pursuit of prosperity--on both an individual and societal level--the goals of the government and the goals of the industry have been the same: maximum resource extraction, maximum profit. This mutual interest has resulted in a legislated forest management policy primarily concerned with industrial values. While the province's politically guided Forest Service is mandated to manage for other values such as wildlife, fisheries and water, legislation governing the province's forests heavily favours timber production (Vance, 1990; Haddock, 1990). What follows is a brief history of the evolution of the industry's influence on forest policy in British Columbia.
When the first settlers of European descent arrived in the 1800s, British Columbia was carpeted with a seemingly endless expanse of forests. The colony's first government initially viewed the forest as an impediment to settlement and in 1859 initiated the outright sale of forested land. At that time the forests were viewed as a liability and not the asset they would soon to prove to be. By 1884 the economic value of the forests was realized by the government, which then changed its policy to prohibit the sale of prime forested lands, preferring instead to lease the rights to the timber while retaining ownership of the land. Only five per cent of the province's forests was sold, while title for ninety five per cent remains with the crown.

With the abundance and quality of the forests, the province attracted numerous speculators and large American owned forest corporations which, with the support of the provincial government, began to cash in the resource. Government policy developed around the basic concept of maximizing its revenue, while at the same time making the province attractive for investors to build mills, create settlements, provide jobs--to literally build the infrastructure of the province. An influx of immigrants from the forest towns of eastern Canada and the United States brought with it the expertise and the attitudes of a logging culture which viewed the forests as a source of employment and wealth. Legislation passed in 1912 established a provincial forest service to assist with the management of the province's forests. A tenure system was established to grant rights to the timber on crown land. Timber Sale Licenses based on either volume or area, and lasting for a defined period of time, were sold to the highest bidder at auctions held by the Forest Service. This licensing system was introduced with the hope of creating a competitive market for logging on public land. But the control of these licenses became increasingly concentrated by highly capitalized companies, which were largely foreign-owned (Gray, 1989). By
1940, 58 companies controlled 52 per cent of the commercial forests (Marchak, 1983, p. 36).

In the early 1940s the Forest Service and the major corporations were lobbying for the implementation of a "scientific" forest management theory called "sustained yield". Sustained yield forestry was promoted by the provincial forest service who saw it as a means of ensuring the long term management of the forest resource. Sustained yield forestry was embraced by industry because it implicitly legitimated the liquidation of the ancient forests, and because it was based on the assumption that large organizations are in the best position to provide the long-term care the theory demands (Drushka, 1985). Consequently, in British Columbia, with its large percentage of publicly owned land, it provided the means for corporations to secure long-term tenure rights, lessen competition through the concentration of this tenure into the control of fewer, larger companies and diffuse public concern over the management of their forest resource by invoking the notion of a scientific management program ensuring the perpetuation of the wood supply (Wilson, 1987/1988).

On December 31, 1943 Chief Justice, Hon. Gordon Sloan was appointed head of a Royal Commission on Forestry, and, four years later, sustained yield policy was introduced in the Legislation of 1947, which led to a revision of the Forest Act in 1948. The first step towards implementing a sustained yield policy was the creation of management units, assigning the right to "normalize"--manage by logging--the forest to both private industry (in Forest Management Licenses--which were later renamed Tree Farm Licenses) and the forest service (in Public Sustained Yield Units). Sloan's intent was to ensure that the management units were small enough to manage on regional basis, under a single working plan. Each unit was to be assessed for the character and quantity of its forests, and then the Annual Allowable Cut (AAC) would be determined.
The process was fraught with uncertainty and open to political influence as it required accurate measurement of the volume of mature timber in the forests and accurate calculations of their present or potential rate of growth in order to set the AAC. In absence of reliable data, cutting levels were subject to "best estimates" which varied widely over the years, and were, as the government sought to increase their share of profit from logging, regularly increased by the chief forester who had final authority for setting the "Approved AAC".

The 1948 changes to the Forest Act gave the Minister of Forests authority over the allocation of management units. This concentration of the decision making power led to political contributions from corporations being used to ensure receipt of rights to management units (Drushka, 1985; Marchak, 1983). With the election of the free enterprise Social Credit party to provincial government in 1952, the corruption of the process created animosity between the bureaucrats and the politicians as the original mandate of the forest service was subverted for political and personal gain (Drushka, 1985). The most blatant example of this corruption resulted in the conviction and jailing of the Minister of Forests. In 1954, land designated for management by small logging companies near Tofino was redefined as a Tree Farm License and granted to a Toronto promoter by the newly appointed Minister of Forests--despite the objection of the chief forester, whose approval was required by legislation. The ensuing controversy resulted in charges being laid against the Minister and two consultants, C.D. Schultz and H. Wilson Gray for accepting and arranging a $30,000 bribe. As the case went through court in 1958, Schultz was acquitted and Sommers and Gray were convicted and jailed. Following the trial the basic structure governing the allocation of forest management units was not changed, decisions made by Sommers prior to his conviction were allowed to stand, and decisions made by successive Ministers continued to concentrate
control of the province's forests in the hands of a few, highly capitalized corporations (Marchak, 1983). While Schultz was acquitted, the controversy led to the demise of his company and his position as the province's most influential forestry consultant (Koop, 1993, p. 40). As we shall see, Schultz played a key role in the formation of GVWD watershed management policy.

During the next fifteen years the debate over forest management in British Columbia subsided under the mantra of sustained yield forestry, and the influence of the post-war years of boom and wealth. Despite the controversy generated by the prosecution of the Minister of Forests, corporate concentration continued to increase, the volume of timber cut annually continued to rise and the Forestry Act was not changed to ensure government accountability. According to the Forest Resources Commission (British Columbia, 1991, p.37), in 1954, the 10 largest companies controlled 37 percent of the Annual Allowable Cut, AAC. By 1975, the 10 largest companies controlled 59 per cent of an AAC which had more than doubled in volume. New legislation introduced in 1978 established longer terms of tenure, and by 1990 the ten largest companies controlled 69 per cent of the AAC (British Columbia, 1991, p. 37).

Throughout this period the goal of maximizing wealth from the province's forests was being pursued with as much reckless abandon as when the province was first settled. In the space of a decade, the capacity of interior pulp mills more than doubled. In order to supply wood fibre to these mills, the existing forest legislation was, in the words of one policy analyst, "bent out of recognition" (Marchak, 1983, p. 39). Operating under the assumption that sustained yield forestry would provide a perpetually increasing timber supply, the Forest Service, under the direction of the Social Credit government, had become little more than an agency serving the forest industry and ensured a flow of fibre equal to the capacity of the mills. As technological advances increased
the efficiency and capacity of the mills, the Forest Service increased the annual allowable cut to meet the political objective of revenue generation. Their decisions had long since ceased to based on the ecological considerations of forest management.

As analysis of forest policy in British Columbia shows, the forest industry has persistently asserted its economic influence to ensure short-term financial gain was given priority over long-term goals of resource management (Drushka, 1993; Gray, 1989; Gillis and Roach, 1986; Drushka, 1985; Marchak, 1983). During times of economic hardship, the provincial government has repeatedly modified its policies to meet the needs of the forest industry. E.C. Manning, one of the province's Chief Foresters during the 1930's, identified two obstacles to implementing forest management within B.C.: politicians whose attitude toward the resource focused on the short term; and businesses which opposed any policy that might diminish their profits (Gillis and Roach, 1986, p. 157). Given the extent of the government's economic dependence on the forest industry, that the same can be said of the present, is hardly surprising. However, given that the forests of British Columbia are publicly owned, and given that the political structure of the province is based on a democratic model, decisions made about the management of provincial resources are subject to electorate acceptance—a point to be further explored in part three of this thesis.

For years the forest industry was able to conduct its business away from heat of informed scrutiny through control of information. Wilson (1987/1988) argues that the period between 1935 and 1970 can be characterized as having a "barren political debate" over forestry issues in British Columbia. This was the condition of the time because the industry complex controlled the terms of the debate; the aura of sustained yield was used symbolically to assure British Columbians that the resource was being replenished at, or exceeding, the rate it
was being cut; and the public, having limited information to indicate problems
with the forest resource, did not assert a landowner's perspective by questioning
either government or industry.

With the election of the Social Credit Party in 1952 and its 20 year run of
uninterrupted political power, the opposition party was barely able to mount
challenges to the existing policies because of: 1) the weak structure of the
democratic system in British Columbia which had short legislative sessions with
no question period; 2) limited funds for the opposition to conduct their own
research into the issues; 3) a tremendous amount of discretionary authority held
by the minister of forests, allowing significant decisions to be made behind closed
doors; 4) a virtual monopoly of expertise aligned with the industry, government,
university, union status quo policies; and 5) the complexity of forestry issues,
which was made all the much more so by a shifting policy base (Wilson,

2.2 LOGGING AND WATERSHEDS
British Columbia is a mountainous, forested province with watersheds and
communities throughout. Surface watersheds provide 91 percent of the
province's fresh water needs (British Columbia, 1993, p. 5). Approximately 12,000
watersheds are licensed to deliver drinking water. Of this number, almost 680
are classified as community watersheds, serving organized communities, while
the balance serve individual land owners living by streams or lakes. The
majority of community watersheds are quite small, with almost one-third
covering less than two square kilometres of land. Less than nine percent of the
community watersheds cover more than 100 square kilometres. In total, the area
contained within designated community watersheds occupies 19,402 square
kilometres, or 2.05 percent of British Columbia's land. (British Columbia, 1994, p.1).

In addition to providing water, watersheds are also a prime source of timber for the forest industry. As a resource, water generates nowhere near the revenue of forestry and, as the following review of legislation governing water clearly indicates, was subsequently given a lower political priority. In terms of revenue generated by issuing licenses for the domestic consumption, municipal and industrial use of water (excluding power generation), in 1994 the provincial government received $5.8 million (Personal correspondence with the Manager of Systems, Accounts and Records, Water Rights Branch, Ministry of Environment, November 1, 1994). For the same period of time, the Ministry of Forests estimates that the provincial government will receive $911 million in timber royalties, an amount which excludes the revenue generated by corporate and personal taxes. With a June 1994 increase in stumpage rates, this amount is expected to increase to $1.15 billion for the 95 fiscal year (Personal correspondence with Ministry of Forests staff, November 1, 1994).

Unfortunately, the extraction of timber from community watersheds typically results in degradation of water quality. Sedimentation and bacterial contamination from increased human activity are both associated with the construction of logging roads. In a brief to a royal commission on health care, the B.C. branch of the Canadian Institute of Public Health Inspectors (1991) reported that B.C. has the worst incidence of waterborne disease in Canada, attributing that dubious distinction to land-use conflicts resulting from the present regulatory structure.

The conflict between the forest industry's need for fibre and the need for quality drinking water is becoming one of the most pressing issues in the province. The population of British Columbia is about 3.7 million, 75 per cent of
which is concentrated in the southwest corner of the province. The Greater Vancouver area alone is home to approximately 1.6 million residents. The province's population is increasing at a rate faster than any other province in Canada, and Canada's population is increasing at a rate faster than any other western industrialized nation (Statistics Canada, 1994). The population of British Columbia is projected to grow by 50 percent over the next 25 years to 5 million (Ngan, 1990). Projection of the rate of growth for the Greater Vancouver area indicates the city will reach a population of 2 million--the capacity of the city's present water supply for the existing consumption patterns--by the year 2005 (GVWD, 1994). As the Greater Vancouver area starts to reach a population saturation point in terms of its present infrastructure, other regions throughout the province are experiencing rapid population growth. This growth in smaller communities is leading to an increase in land use conflicts as the activities of their dominant resource-based industries clash with the needs of the expanded population.

Throughout B.C. there is widespread frustration with watershed management policies and legislation: 18 of the 27 regional districts are concerned about the impact of logging on their water quality (Crippen, 1990, p. 5). In 1990, Hazelton's municipal government, after years of monitoring the impact of forestry on their community, created a Forest Industry Charter of Rights and sent copies to every municipal and regional district government in British Columbia. The Charter specifically addressed the issue of logging in community watersheds, calling for any logging planned in community watersheds to be approved by the water license holder, and demanding that any damage to a watershed be remediated at the expense of the provincial government. Also in 1990, at the Union of British Columbia Municipalities annual conference, an association representing the province's towns and municipalities, resolutions were passed
calling for the provincial government to assume responsibility for regulating logging in community watersheds to offer protection to water quality; and to ensure that the major water license holders have final approval and control over activities occurring within the watersheds providing their water supply (Union of British Columbia Municipalities, 1990, p. 12).

2.3 WATERSHED LEGISLATION

The legislative structure affecting British Columbia's fresh water is organized around two distinct approaches: regulations governing water quality from a health perspective and regulations governing water allocation from a commodity perspective. A separate body of legislation regulates activities on land adjacent to water. The legislation is spread among a number of agencies at all levels of government.

At the federal level, Health and Welfare Canada (HWC) is responsible for establishing water quality standards for the nation. Their "Guidelines for Canadian Drinking Water Quality" cover microbiological, physical and chemical agents, setting maximum acceptable concentrations (MACs) in each of these three categories. The guidelines also establish acceptable turbidity levels measured in nephelometric turbidity units (NTUs). According to the guidelines, "The maximum acceptable concentration of turbidity is 1 NTU for water entering a distribution system. A maximum of 5 NTU may be permitted if it can be demonstrated that disinfection is not compromised by the use of this less stringent value" (Health and Welfare Canada, 1990). HWC has no legislated mandate to enforce these levels as they are guidelines and not law.

At the provincial level, the British Columbia Ministry of Health (MOH) has incorporated the HWC recommendations into the "B.C. Drinking Water Guidelines," which are part of the Provincial Health Act. These B.C. guidelines--
once again not legally binding—are implemented and monitored by the ministry's Medical Officers of Health (MOHs) throughout the province. While the *Health Act* does provide the ministry with authority to address threats to public health, which theoretically should include drinking water quality, this authority has not been transferred from the ministry to the MOHs on threats related to drinking water, leaving them with no legal recourse on issues of water quality (Bryce, 1990, p. 196).

At the municipal level, the *Municipal Act* allows municipalities to buy water from suppliers, and to establish bylaws governing its use. These bylaws, where they relate to health, must comply with provisions of the *Health Act*. A few municipalities—Vancouver, North Vancouver, Richmond and Burnaby—have Medical Officers of Health (MOHs) working as employees, of the Municipal Board of Health. These MOHs adhere to the provincial and federal guidelines, and are also free to set more rigid standards under the *Municipal Act*'s bylaw provision if they so choose.

A second provincial Ministry, the Ministry of Environment (MOE), has the legislated responsibility for water use within the province. Under the 1979 *Water Act*, the MOE regulates fresh water supplies not in terms of health, but in terms of resource allocation: "there is no provision in the Act or any of its regulations which establish standards for safe domestic water. Further, no section provides clear authority to address public health concerns relating to domestic water" (Bryce, 1990, p. 197). The MOE, through the provisions of the *Water Act*, can grant licenses for the use of water to districts and municipalities. It was through these provisions that the *Greater Vancouver Water District Act* was tabled, transferring authority to the GVWD to manage and utilize water from the Capilano, Seymour and Coquitlam watersheds.
A third provincial Ministry, the Ministry of Forests (MOF), has legislated responsibility for utilization of forested lands throughout the province under the *Forest Act* and the *Ministry of Forests Act*. The MOF controls the approximately 85 percent of British Columbia's land base designated as provincial forest. This includes the vast majority of watersheds within British Columbia, including the Capilano, Seymour and Coquitlam watersheds. According to a provincial government commissioned study examining municipal water issues in B.C., the MOF "has more power over the fate of water supplies than the regional district or the municipalities who actually use the water. Paradoxically, the Ministry of Forests has no special mandate to manage water" (Crippen, 1990, p. 6-2). While the MOF does have a legislated mandate to manage for values other than timber production, according to a Canadian Bar Association report analyzing the province's forestry legislation:

The present legislation very clearly gives priority to the timber resource and the agency which manages it. It makes casual mention of other resource values but offers no real mechanism for incorporating those values, the agencies responsible for managing them, or the individuals utilizing them, into the forest planning process (Haddock, 1990, p. 89).

In terms of logging in watersheds, a lack of a legislated mandate to manage for water quality has representatives of regional districts throughout the province frustrated by their lack of control of the water resource. A watershed planning process (Integrated Watershed Management Plans [IWMP]) was initiated by the province through the Ministry of Environment in an attempt to address the frustrations over forestry practices in watersheds (British Columbia, 1980), but, as the Crippen report found, "few municipalities or regional districts consider the current system to be effective" (1990, p. 6-2). As it stands, not only do local governments "have few powers to alter forest management activities in publicly owned watersheds," they do not have the "explicit authority within
watersheds to manage water quality and quantity for domestic consumption" (Crippen, 1990, p. 6-2). Also, under MOF management the legislation does not give the province's medical health officers and public health inspectors sufficient legal authority to deal with health problems originating from activities in watersheds providing community water supplies (British Columbia Medical Association, 1990).

As the above discussion suggests, there is regulatory ambiguity and a lack of legislated authority over water quality issues in British Columbia. A detailed analysis of the province's legislative structure concluded that: "There is currently no comprehensive legislation or government program which provides authority to a single agency to enforce water quality standards to protect the public from unsafe sources of drinking water" (Bryce, 1990, p. 198). The B.C. branch of the Canadian Institute of Public Health Inspectors believes that the lack of adequate legislation has led drinking water quality to become a major health issue in British Columbia (Canadian Institute of Public Health Inspectors, 1991).

In response to concern over the identified deficiencies of the regulatory structure and the economic implications of demands for government funded remediation of damaged watersheds, the government of British Columbia initiated, in 1991, a review of its water policy and legislation. A preliminary discussion paper titled *Sustaining the Water Resource* was released in August of 1991. In 1992, a multi-agency technical advisory committee, with the Ministry of Forests as the lead agency, was formed to review and rewrite the 1980 *Guidelines for Watershed Management of Crown Lands used for Community Water Supplies*. Revised draft legislation was scheduled to be released in the spring of 1994 as part of the government's Forest Practices Code. As of November 1994 the draft legislation has yet to be released. In a separate initiative, the Ministry of Environment conducted a public review of the province's water management
policy and legislation. A detailed discussion paper titled *Stewardship of the Water of British Columbia* was released in July of 1993.

2.4 THE GVRD WATERSHEDS

Of all the watersheds in British Columbia, the three serving the Greater Vancouver Regional District (GVRD) are widely regarded to be under the best management program in the province. This is largely due to the fact they have been set aside exclusively for the purpose of providing water to the residents of the Greater Vancouver area. Unlike many other watersheds throughout British Columbia, resource conflicts--i.e. timber production impacting on water quality--are theoretically not supposed to occur because any activity that does not contribute to maintaining water quality is legally forbidden under the *Greater Vancouver Water District Act* of 1926.

The Capilano, Seymour and Coquitlam watersheds are located in mountains of the Coastal range bordering the northern edge of the greater Vancouver area. From Burrard Inlet, these mountains rise steeply to a height of up to 1,800 metres. Glaciated valleys lined by cliffs and steep granitic slopes punctuate the landscape, providing natural basins for rivers and lakes. As repeated glaciation widened the valleys, thick deposits of clay, silt and gravel buried much of the bedrock. Subject to intense storm activity, annual precipitation ranges from approximately 3,800 millimetres at valley bottom to 5,100 millimetre at higher elevations. Most of the precipitation falls as rain, with higher elevations receiving seasonal snowfall. The combination of heavy rainfall, steep slopes and glacially deposited soils in a high intensity environment is conducive to both extraordinarily rich forest growth, and erosional processes.
These watersheds have provided water for the region's European settlers for over 100 years. In 1884 there were fewer than 1,000 European's living along the shores of Burrard Inlet (Kahrer, 1988). In 1901 census figures show a population of over 28,000 in the Vancouver area (MacDonald, 1970). Thirty years later, according to the first census conducted after the creation of the GVWD, a city of over 300,000 residents was dependent on the watersheds for drinking water (MacDonald, 1970). As of 1993, 1.6 million people are living in the Greater Vancouver Regional District (GVRD, 1994). Estimated growth for the area based on current trends has the population reaching 2 million by the year 2005 (GVRD, 1993).

As the region's population expanded, so did the water supply system. In 1889 the Capilano watershed was the sole source of drinking water. By 1908 the Seymour watershed was added, and in 1931 the Coquitlam watershed became part of the water system. Additional storage capacity was added in 1952 with the construction of the Cleveland dam, which was followed by the construction of the Seymour Dam in 1958. The present capacity of the water system is estimated to be adequate for a population of close to 2 million people (GVWD, 1993).

2.5 ADMINISTRATION OF THE WATERSHEDS

The management of the Capilano, Seymour and Coquitlam watersheds falls under the jurisdiction of the Greater Vancouver Regional District (GVRD). The GVRD is an organization representing the communal interests of the municipalities and electoral districts in the greater Vancouver area. Established in 1967, the GVRD enables municipalities in the region to share the costs and management of essential services. These include such basics as water, sewage, solid waste disposal, hospital planning and financing, labour relations, social housing and parks.
Interests of the individual municipalities within the GVRD are represented by their elected officials sitting on the GVRD's Board of Directors. Every 20,000 residents of a particular municipality represents one vote on the Board, and each director is allowed up to five votes--meaning larger municipalities have more than one representative on the Board. These politicians are responsible for the effective management of the various activities undertaken by the GVRD. In order to adequately supervise the wide range of services provided by the GVRD, the directors form a number of committees, with each focusing on a specific activity. Activities relating to water quality are supervised by the Water and Environment Committee, consisting of 10 directors.

2.5.1 the GVWD

Within the GVRD bureaucratic structure, the Greater Vancouver Water District (GVWD) is one of five separate corporate entities including the Greater Vancouver Regional District, the Greater Vancouver Sewage and Drainage District, the Greater Vancouver Regional Hospital District and the Greater Vancouver Housing Corporation. Established in 1926, the GVWD is the oldest of these entities and is responsible for all services and facilities pertaining to the delivery of drinking water to 16 participating municipalities. This includes everything from the protection of the watersheds to the construction of dams, pipelines and purification facilities.

According to the 1993 GVRD Annual Report, the GVWD--which consists of quality control, construction, treatment, planning and watershed management divisions--has a staff of 227, and operates with a $38.6 million budget (GVRD 1993 Annual Report. 1994, p. 6). Of this amount, the watershed management division accounts for 36 full and part-time employees, and has a budget of approximately $2 million (personal correspondence with Lloyd Delany, GVWD Watershed
The GVWD watershed management division, representing just a fraction of the GVWD's staff and budget, is responsible for the introduction and continuation of logging in the name of water quality.

The GVWD was created with the proclamation of the Greater Vancouver Water District Act on September 3, 1926. Under the guidance of E.A. Cleveland, the agency's first Chief Commissioner, the GVWD proceeded to purchase all remaining private lands in the Seymour and Capilano watersheds. In 1931 the Coquitlam watershed was added to the GVWD's jurisdiction. By 1936 Cleveland achieved his goal of having all commercial logging in the watersheds phased out of operation. In 1939 a 999 year lease for the watershed lands was signed over to the GVWD from the provincial government. The lease stipulated that the lands be used "only for the protection and the purposes of its source water supply," and that the GVWD ensure "the protection and preservation of the timber upon the demised lands from fire" (Economic and Engineering Services, 1991, p. 10).

With the death of Cleveland in 1952, the GVWD, after 25 years of staunch opposition to logging in the watersheds, started their move towards sustained yield forest management. This move coincided with the election of the new provincial government and its desire to maximize revenue through the liquidation of the forest resource. The first report recommending multiple use and sustained yield forestry was written by C. D. Schultz (1956), the politically connected forest consultant who was implicated in the corruption scandal that culminated in the conviction and jailing of the Minister of Forests.

The GVWD formally adopted the management philosophy developed in the Schultz report with the signing of the Amending Indenture in 1967. The Amending Indenture established the principle of sustained yield management "for the purpose of developing, protecting and improving the water-yielding
characteristics of the lands by growing continually successive crops of forest products to be harvested in approximately equal amounts or periodic cuts adjusted or equal to the sustained yield capacity of the lands..." (British Columbia, 1967, p. 2). Under the terms of the Amending Indenture, the watershed forests were to be managed like a Tree Farm License (TFL), with GVWD responsible for having a registered professional forester prepare management plans detailing the logging of a sustainable volume of timber--the Annual Allowable Cut (AAC)--to be determined by the Ministry of Forests (MOF). The GVWD was required to submit these management plans to the MOF for approval, and allow MOF personnel into the watersheds to inspect and monitor management activities. Furthermore, the GVWD was required to cut, within 10 percent over five year periods, the total AAC as determined by the Ministry of Forests. GVWD was to pay stumpage rates to the provincial government based on the volume of wood cut, with the remaining profit realized from the sale of the wood available for use as the management saw fit.

According to the GVWD Commissioner during the revision of the lease:

This Amending Indenture will make it economically possible for the Water District to control the quality and possibly increase the quantity of water from the watersheds by developing and implementing a long term rotating program of removal of forest products from its watersheds and the replacing of over-mature, decadent and diseased trees with young, thrifty stands of growing timber. It is also expected that an annual income will be achieved in perpetuity from this operation (K. E. Patrick, Commissioner, Greater Vancouver Water District, Minutes of the Administration Board. September 9, 1966, p. 6).

To ensure that the primary objective of providing water quality be maintained, it was explicitly written into the Amending Indenture:

"That the parties hereto recognize that the highest priority in the management of the lands to which this Amending Indenture applies
must be given to water supply purposes, both in terms of quality and quantity of water and that the provisions of the forest management plan must be secondary to this objective." (British Columbia, 1967, Clause 24 p. 6).

To ensure forest management would not restrict the GVWD into a course of action that might prove to be detrimental to water quality, clause 25 provided "That this Amending Indenture may be terminated by either party giving the other twenty-four months notice in writing."(British Columbia, 1967, p. 6).

For the next 24 years the GVWD conducted a sustained yield management regime in the watersheds, with the revenue derived from the sale of the timber being used to subsidize the management practices. Their management policy was, and continues to be, based on the assumption that the watersheds' old growth forests contain "decadent", "overmature" trees and are in fact in decline. According to GVWD the greatest threat to water quality from these "overmature" forests is fire which would release ash and soil into the water supply. In order to address the threat to water quality presented by the old growth forests, they have been using a sustained yield management regime to develop a "more diverse, multi-aged forest that is healthier and better able to resist insects, disease and fire than an unmanaged stand" (Economic and Engineering Services, 1991, p. 22). The GVWD also believes that a network of roads in the watersheds is essential to fight fires and access debris torrents that threaten the water supply. Since the implementation of the Amending Indenture, GVWD has been constructing roads and "converting" the old growth forests "into managed stands with a balanced distribution of age classes and a diverse species mix" (Economic and Engineering Services, 1991, p. 22).

A review of GVWD management policy and practices was conducted in 1991 by a panel of consultants hired by the GVWD administration (Economic and Engineering Services, 1991). The review recommended that the sustained yield
approach to watershed management was not appropriate for the watersheds because it attempted to "balance water quality objectives with timber harvesting and related economic benefits" (Economic and Engineering Services, 1991, p. ES7). The review cited the conflict between the need to meet an AAC and the maintenance of water quality as being unacceptable, and consequently recommended that the Amending Indenture be renegotiated. Despite recommending the end of a sustained yield management approach, the review endorsed the underlying assumption that the old growth forests are thought to be in decline and in need of replacement by younger more stable stands. In order to continue to manage the watersheds the review concluded that: "All management activities must be conducted within a risk management framework--with well-defined long rang goals, objectives and decision-making criteria based on the principles of watershed resource protection" (Economic and Engineering Services, 1991, introduction). In the name of the new risk management framework, and guided by their principles of good forest management, the GVWD has continued to log "diseased" timber and areas with a high fuel loading. The definition of these "principles" and the assumptions upon which they are based are central to the debate over watershed management, and will be discussed at length in the following chapter.

With the existing regulatory structure, the GVWD has authority over the management of the water in the Capilano, Seymour and Coquitlam watersheds. They also have the responsibility and authority for maintaining water quality within the guidelines set by federal and provincial governments. It is up to their discretion as to how to best achieve this objective. For management of the watershed lands, the GVWD has abided by the terms and conditions of their TFL tenure agreement with the MOF. Following the recommendation of the 1991 review of watershed management practices, the GVWD has initiated discussions
to change the terms of the Amending Indenture to remove the TFL mandate. As of 1994 this has not been achieved. Nowhere in this regulatory structure are mechanisms by which 1) water quality can be legally enforced, or 2) GVWD management activities can be legally challenged.

2.5.2 the economics of GVWD management

The consequences of introducing sediment into a water system are significant. First, in terms of a health concern, sediment decreases the efficiency of chemical agents used to kill bacteria. The more sediment in the water, the more chemicals are needed. As explained in the review of legislation, the federal government's agency responsible for health has set limits for acceptable amounts of turbidity, designed to ensure the chemical treatments remain effective. If the turbidity regularly exceeds the federal guidelines, filtration is necessary. And filtration is an extremely costly option. As a result of the Seymour and Capilano watersheds' inability to meet the federal guidelines, filtration is being considered by the GVWD. The construction of filtration facilities is estimated to cost $150 million for the Seymour reservoir and $200 million for the Capilano reservoir (GVRD, 1993). In addition to the filtration, upgraded primary and new secondary disinfection facilities are needed to treat the water at an estimated cost of over $1 billion for the entire water system (GVRD, 1994).

A second concern related to the sedimentation of the water supply is the deposition of sediments in the reservoirs. Naturally occurring erosion in a watershed results in the transport of sediments. This sediment is deposited along the course of a stream or river, at the bottom of lakes or at river mouths in the form of deltas. The construction of a dam interrupts the natural flow of sediment, resulting in the deposition of sediment in the reservoir itself. Prior to the construction of the Capilano Dam, sediments deposited at the mouth of the
river were dredged on an annual basis to ensure that the entrance to Vancouver's harbour remained clear. Prior to the construction of the Seymour Dam, the gradient of the river was such that coarse sediments were transported below the site of the dam. These sediments are now trapped behind the dams in a process which is gradually reducing the storage capacity of the reservoir (Gerath and Smith, 1993). The reduction of reservoir storage capacity is a problem faced worldwide (Reisner, 1992; White, 1982). It is both technically difficult and expensive to remove the deposits, therefore, minimizing the risk of sedimentation is the most practical course of action.

Sedimentation occurs from natural sources such as landslides and the scouring action of flood water. Sedimentation also occurs from human activities. As the second section of this thesis will show, research has consistently found that the natural rate of sedimentation increases with the roading and cutting of watershed forests. While the GVWD conducts its watershed management more cautiously than commercial logging operations, sedimentation is occurring as a direct result of their activities. The GVWD's watershed management program may very well be necessitating the construction of filtration and treatment facilities, and decreasing the life span of the reservoirs.

In 1967, the Amending Indenture allowed the GVWD to fund their watershed management activities with revenue derived through the sale of logs. Until 1992, a wide range of operating costs were charged against the gross revenues from the sale of logs. These costs included: staff wages, road construction, capital expenditures, interest on investment, taxes on watershed lands, watershed security, and amortization of main roads. (This funding arrangement was discontinued after a 1991 review of the GVWD management practices found that it "creates a potential dilemma for GVWD staff who need to
harvest timber in order to maintain funding for the existing watershed programs" [Economic and Engineering Services, 1991, p. 75]). From 1961, when salvage operations began in the Seymour watershed, to the end of the 1978 fiscal year, the GVWD reported that the net income from the sale of logs totaled $1,242,149 (GVWD Commissioner's Report from the minutes of the July 19, 1979 Waste and Water Committee meeting, Appendix A). In 1978 a fund was established in which annual profits could be held in reserve to cover any future loss (GVWD Commissioner's Report from the minutes of the July 19, 1979 Waste and Water Committee meeting, p. 3). By December 31, 1988, this reserve fund had grown to $8,886,494 (GVWD, 1989 Final Budget, p. 22).

In an attempt to arrive at a rough estimate of the gross revenue derived from logging in the watersheds since 1961, I reviewed both GVRD Annual Reports and GVWD annual statements. With the exception of one ten year period, there was no documentation offering a clear breakdown of revenue and expenses from logging. In 1988, a news account reported that $60 million worth of timber had been removed from the watersheds (Vancouver Sun, December 22, 1988. B4). From 1988 to 1993 another $50 million of timber was removed (GVWD Annual Budget, 1988-1991; GVRD Annual Report, 1991-1993). The gross revenue derived from logging the watersheds is then approximately $110 million--before the GVWD management expenses are deducted. This amount does not even cover the cost of just one of the filtration facilities now thought to be necessary, and just over ten per cent of the cost of the $1 billion water treatment program initiated in 1994.

It has long been said that the GVWD's most valuable resource is the water. In 1922, E.A. Cleveland argued that logging had no place in the watersheds because of the adverse impact it had on water quality. Framing his argument in economic terms, he asserted that:
Considered as economic resources, it is not open to debate that the value of these watershed areas lies first in their importance as sources of pure water supply and secondly as stands of merchantable timber (Cleveland, 1922, p. 85).

In 1993, the sale of water to the region's municipalities generated $32.9 million for the GVRD (GVRD, 1994, p. 18). The same report shows that for 1993 the GVRD generated $8,366,000 through the sale of watershed logs, from which costs of $5,534,000 were deducted, for a net gain of $2,832,000 (GVRD, 1994, p. 18). This amount is less than one tenth of the revenue generated through the sale of water for the same period. Given the value of the water resource, it seems logical to expect the GVRD to take an extremely cautious approach towards watershed management.

2.7 CONCLUSIONS

The revenue generated from forestry has influenced British Columbia's physical landscape, political development and legislative structure since the turn of the century. In terms of the conflict between logging and community watersheds, the economic interests of the forest industry have consistently been prioritized in legislation. As a result of logging in community watersheds, numerous communities are suffering the consequences of a degraded water supply, which contributes to the province having the highest incidence of water borne disease in Canada. The problem is complex as untreated surface watersheds supply the majority of the province's population. In rural areas, water is drawn directly from small creeks and lakes by thousands of individuals. To stop all industrial activities in all of the areas used as a source for drinking water would tie up much of the province's land area, hence the threat to industry and government. While there is an official community watershed
designation for watersheds supplying organized communities, it has no authority to prevent logging in what amounts to just 2 per cent of the province's land area. Not only does the existing legislation fail to protect these watersheds, it also provides no legal recourse to make logging companies liable for the restoration of any damage their activities cause. Thus the profit accrues to the company logging, while the cost is borne by the community—in both health and financial terms. This situation has frustrated communities throughout the province, and as the province's population grows, it is likely to become increasingly confrontational.

In the Greater Vancouver area there is no reason for this conflict to exist. The GVWD was established for the exclusive purpose of supplying quality drinking water. Initially opposed to any logging in the watersheds, the GVWD was introduced to the principles and assumptions of sustained yield forestry in the mid 1950s. Consultants with expertise in industrial forestry convinced the GVWD management that sustained yield forest management could improve the health of the watershed forests and generate income. In 1967, the legislation governing activities within the GVWD watersheds was amended to allow logging on the watershed lands leased from the government. The profit from the sale of watershed logs was used to fund their watershed management operation. When compared with the expense of filtration and water treatment facilities—which may be necessary as a direct result of the watershed management activities—both the gross revenues and net profit from logging are negligible. The residents of the Greater Vancouver area will be liable for the cost of filtration while, and, as this thesis will argue, the benefit of the logging will accrue to the forest industry. This benefit has nothing to do with money generated by logging the GVWD's watersheds, and everything to do with the maintenance of the
authority needed to define "good" watershed management practices throughout the province.
CHAPTER III.
THE SCIENCE & EXPERTISE OF WATERSHED MANAGEMENT

3.1 INTRODUCTION

As our society grows in both size and complexity, the management of natural resources is becoming increasingly difficult. Rapid advances in technology and science are both increasing the impact of our activities and our ability to measure the presence of the associated toxins. This has led to an increasing reliance on science to estimate the limits of "acceptable risk". These estimations cover such diverse and technically difficult subjects as human exposure to toxins, the emission of ozone depleting chemicals, and the containment of radioactive materials. Given the complexity of natural systems, these "scientific" estimations are typically determined through laboratory experiments, which cannot hope to replicate the full range of variables influencing any given process. Despite the uncertainty surrounding the science, the resultant estimations of acceptable levels of risk are used as the basis of government policy.

The information science provides is not an absolute measure of safe or unsafe, it is merely a point of reference based on assumptions as to what is thought to be acceptable. The regulation of pesticides provides a good example of this point. Pesticides are evaluated for their toxicity to laboratory animals. Based on the results of those experiments, along with the addition of a significant margin of error, a number is arrived at which sets the safe human exposure as being a number of parts per million. Research has shown that estimations of the acceptable level of exposure vary significantly between university, government and industry researchers, with industry researchers consistently arriving at a less
conservative measure (Jasanoff, 1990). The difference is not so much attributed to methodology, but to judgments based on the value of the substance in question.

Given science's increasing role in the setting of policy, the discrepancy between the conclusions of the various research groups has significant political implications. As the definition of the "best science" is open to debate, then science itself becomes an opportunity for various interest groups to promote their interests. Continuing to use the example of pesticides, if the industry's definition of good science is adopted by government, then the policy governing acceptable exposure levels would be established in accordance with industry values, which equates to their economic interests.

The importance of science in setting policy is well understood by industry, which is actively engaged in developing the expertise necessary to further their interests. This is done by funding researchers who are either in their employ, or working in an academic context. As the following section of this study will argue, the definition of good watershed management practices has been established to meet the economic needs of the forest industry. In British Columbia, there is a long history of the industry's involvement with the University of British Columbia's Faculty of Forestry. As a result of this relationship, a 1989 UBC internal review formally criticized the School of Forestry for sacrificing academic excellence in exchange for the financial benefits of supporting the industry. In response to this review, the Dean of the faculty at that time, Robert Kennedy, wrote a memo to his superiors saying:

To be completely realistic, the faculty must be circumspect about their involvement in controversial or emotional issues. The large integrated companies are increasingly sponsoring or supporting our faculty's research. They can be easily alienated by the perception that the faculty is
promoting a subject which they deem not to be in their best interest. (as quoted in Forest Planning Canada, March/April 1990, p. 26).

Through judicious funding of U.B.C. researchers, the industry was able to develop and promote theories of forestry which were in their economic interests. The most significant of these theories for watershed management issues is sustained yield forest management.

The following section of this study looks at the various processes which occur in a watershed and the management issues they present. After briefly reviewing the threats to water quality as identified in the literature, the paper looks at the watershed management practices of the GVWD and the assumptions upon which they are based. This is followed by a look at how sustained yield policies were introduced to GVWD management.

3.2 THE SCIENCE OF WATERSHED MANAGEMENT

Watersheds are defined by the geographic height of land from which water flows into a given catchment area. The movement of water within a watershed is an extremely complex process and is governed by a number of factors including steepness of slope, proximity of bedrock to soil surface, composition of soils, vegetation, and variables in climate such as temperature, and volume and intensity of precipitation. Any given watershed is part of a hydrological cycle in which evaporated water from bodies of water such as the ocean and lakes is, transported over land, condenses into clouds and falls as precipitation. Water which is introduced into a watershed in the form of precipitation is either intercepted by, and incorporated within, vegetation; absorbed by the soil surfaces in a process called infiltration; or, if water is introduced at a rate which exceeds the soil's capacity to absorb it, flows as surface water called runoff.
Evaporation and absorption of water from soil and vegetation is called evapotranspiration. It is a particularly significant process in forested lands because forests transpire between 6-40 percent more water than other types of vegetation (Heatherington, 1987). In the transpiration process, the deep root structure of trees draws water from the water table and circulates it throughout the trunk, branches and needles, from where it is returned to the atmosphere as water vapor. The process of evapotranspiration regulates streamflow as the vegetation itself becomes a water storage site.

In addition to transpiring water, the canopy of a forested watershed intercepts precipitation, protecting the soil below from the impact of torrential rains. The soil, which is covered by a mat of decaying needles and branches, breaks the force of drops falling from the canopy and maintains its porous character through which the water can infiltrate. When precipitation falls in the form of snow, the canopy intercepts an even greater percentage of it than when it falls as rain. The canopy also shelters snow on the forest flow, slowing the spring melt by protecting it from the direct impact of heavy spring rains. When rain falls directly on snow, the resultant rain-on-snow event releases the combined water volume of rainfall and snowmelt, significantly increasing the severity of flooding. Rain-on-snow events have been credited with causing virtually all the major floods in the Pacific Northwest, conversely, the canopy of an old growth forest has been identified as providing the greatest protection, or to put it another way, the lowest risk, from rain-on-snow flooding (Franklin, 1988).

Water which infiltrates the soil and fully saturates the space between soil and rock below the surface is known as groundwater, and the upper surface of this groundwater defines the water table. Precipitation which percolates through the soil and reaches the water table continues to flow underground to the point where the water table intersects the ground surface, at streams, marshes and
lakes. If precipitation occurs at a rate which cannot be absorbed by the soil—an extremely rare event in forested watersheds due to the porous nature of the soil (MacKinnon et al, 1991), the excess water moves on the surface of land as runoff to small streams in sub-drainages, which in turn flow into larger creeks and rivers in drainages. A watershed’s drainage system integrates the movement of runoff from its weakest form of surface movement into progressively more intense streams and rivers, which flow into lakes or make their way to the ocean.

The overland movement of runoff has the potential to introduce sediment into streams, rivers and lakes. Known as sheet or surface erosion, the transport of particles occurs when soil is saturated and runoff moves downslope. A second form of erosion is streambank erosion and occurs as stream flow increases and scourss particles from stream beds and banks. A third form of erosion is mass wasting, which occurs when the force of gravity precipitates the movement of soil, rock and vegetation. Research on erosion in the Pacific Northwest has shown that while all three forms of erosion occur on a episodic basis, the rates of surface erosion in forested watersheds are very low (MacKinnon et al, 1991) and mass wasting is by far the dominant form (Swanson et al, 1989).

The objective of any management regime for a surface watershed is to maintain water quality and quantity. Quality water is defined as water which has low turbidity, low levels of dissolved nutrients, low levels of bacteria and cool temperatures (Travers, 1991, p. 29). Additionally, watershed management seeks to prevent contamination of the water supply which can occur either microbiologically, through the transmission of disease, or chemically, through the introduction--either accidentally or intentionally--of toxins. If contamination occurs, it can, in most cases, be treated by the use of various agents to disinfect the water supply. If, however, sedimentation occurs, the
suspended sediments interfere with the effectiveness of the chemical agents used to treat the water. In order to effectively treat the turbid water, increased amounts of the disinfectant must be used, or the sediments must be removed, which requires expensive filtration facilities.

### 3.2.1 Threats to Water Quality

Forested watersheds quite simply provide the best quality water (MacKinnon et al, 1991; Franklin, 1990). Any process which has a significant impact on forest stability, whether naturally occurring or a product of human activity, is a threat to water quality. A loss of forest cover destabilizes soils, increases overland flow of water, introduces sediment into the water, increases water temperature and changes both the nutrient and organic content of the water. Research has shown that old growth temperate rain forests of the type found in the GVRD watersheds are resilient to fire, pest infestations and decay (Franklin, 1988). While each of these processes occur in old growth, the extent of the occurrences do not undermine the structural integrity of the forest as a whole, rather they are part of a dynamic cycle which maintains its health (Franklin, 1988; Maser, 1990; Hammond, 1991). Furthermore, research has shown that human disruption of old growth forests can result in an increased incidence of fire, pest infestation and disease. The following section of this paper provides a brief overview of the issues surrounding these threats to water quality.

#### 3.2.1.1 Logging

While erosion from mass wasting occurs naturally, forest management activities have been shown to increase rate of erosion by between 2 and 300 times the natural level (Schriver, 1993, p. 18). There is, and has been for years, consistent evidence from research indicating negative impacts associated with
logging in watersheds. Conversely, there is no evidence which indicates logging improves the quality of water flowing from an old-growth forest (Travers, 1991; Franklin, 1990). Given the complexity of the hydrological cycle and of natural systems in a watershed, absolute measurements of the impacts from logging are difficult to obtain. However, that there will be some impact is well established. The degree to which impacts occur is dependent upon a wide range of variables, some of which can only be mitigated in part by the choice of logging technique. Jeffrey's (1968) research found examples of poor logging techniques producing negligible amounts of sediment; conversely, he found examples of exemplary logging techniques producing a great deal of sediment. He attributed the difference in sediment production to the soil characteristics of each individual watershed, which illustrates the difficulty of minimizing the impact of a management regime.

In British Columbia, removal of forest cover is accomplished primarily through clearcutting--a standard forestry practice accounting for approximately 90 percent of the annual area logged, and the principal technique used in the Capilano, Seymour and Coquitlam watersheds. Clearcutting increases the occurrence of mass wasting by:

1) a decrease in evapotranspiration, leading to an increase in soil moisture content, increased porewater pressure, and potential for overland flow; 2) a decrease in root strength; 3) windthrow along clearcut edges accelerating soil disturbance and transport; 4) debris and surface sediment accumulation in gullies and depressions where mass wasting often originates; and 5) changes in drainage due to soil compaction from yarding systems (Schriver, 1993, p. 26).

With the loss of forest canopy and a disturbance of the upper surface of soil, the full energy of rain falls directly on the forest floor, compacting the porous character of the soil, and increasing surface runoff flows. Without the
tree to absorb water through transpiration, the amount of water entering the soil increases, which can result in a significant rise in the level of the water table, which reduces the capacity of the soil to absorb water before saturating, and significantly, saturated soils are more vulnerable to mass wasting events. Also, without the canopy, snow which accumulates on the forest floor is susceptible to rain-on-snow events and the subsequent increased volume of runoff.

The root structure of forests helps to stabilize soils, and with the removal of the trees the decay of roots leaves the soil more vulnerable to mass wasting events. In research conducted in the GVRD watersheds, O'Loughlin (1972) found that root structures provide up to 49 percent of the soil's shear strength, which is defined as the combination of properties offering resistance to stress of gravitational force. Depending on the specifics of species and location, the decay of roots can take a number of years before the soil is at risk of sliding. In west coast forests it has been shown that Douglas fir and cedar roots lost 50 percent of their strength within three to five years of being cut (O'Loughlin, 1974).

3.2.1.2 road construction

The activity consistently shown to have the greatest impact on the rate of erosion—in terms of number of slides and volume of material—is the construction of roads. Four major factors associated with road construction increase the risk of mass wasting:

1) interruption of surface drainage associated with road surfaces, ditches, and culverts; 2) alteration of subsurface water movement due to redistribution of soil and rock material, especially where road cuts intersect a water table; 3) change in the distribution of soil mass on slope surfaces by cut and fill construction where side casting may overload a slope, and undercutting may remove support; or 4) inclusion of snow or organic debris in road-fill during construction which aggravates instability. ...Where road construction and logging activity takes place on preexisting, older landslides, the risk of initiating new landslides becomes even greater (Schriver, 1993, p. 25).
The density of road networks is dependent upon the yarding system used. While the selection of yarding system can mitigate soil disturbance, soil disturbance occurs nonetheless. Reviews of the impacts of various logging systems in the pacific northwest showed that soil disturbance from skylines amounted to between 5 and 20 percent of the total area harvested; from highlead systems between 15 and 50 percent; and from ground skidding between 15 to 60 percent (Froelich, 1988; Utzig and Walmsley, 1988). Proponents of logging believe the impacts of logging can be mitigated by the application of best management techniques. The 1991 review of GVWD management practices reports that "It is well established that the application of best management practices can significantly reduce erosion" (Economic and Engineering Services, 1991, p. 33). What the authors are referring to is that the erosion produced by logging and road construction can be lessened by careful implementation of road building and logging. What the authors are not referring to is improving upon the condition of an untouched watershed.

3.3 GVWD WATERSHED MANAGEMENT

According to the GVWD, the main threats to water quality from the watershed forests are bug infestations killing trees and resultant fires, which would release ash and soil into the water supply. The GVWD believes that replacing the "decadent" old growth forests with "diverse, multi-age stands" of trees will minimize the risk from these threats by creating a "more stable" forest environment, while at the same time providing the economic benefit of logging. The overall impact of implementing the management plans has been the construction of approximately 270 kilometres of logging road, and the cutting of 3,797 hectares of forest (Economic and Engineering Services, 1991, p. 30). The
GVWD reports that they have logged 6.7 percent of the watershed land base. This figure is calculated by including only the forest cleared by their management operations--excluding both logging prior to 1934 and the area of land cleared for roads--from the total 57,971 hectares of lands in the watershed, which includes 33,529 hectares of land excluded from forest management plans. Logging prior to the management activities of the GVWD accounted for the removal of an additional 6,178 hectares of forest in the three watersheds (C. D. Schultz, 1956). The road construction, 270 kilometres with right of ways averaging 66 feet in width, accounts for the removal of approximately 600 hectares (Koop, 1993, p. 69). The combined total removal of watershed forests from road building, pre-GVWD logging, and GVWD management activities is 10,575 hectares, or 18.9 percent of the total watershed lands. With the forest available for logging defined as 24,442 hectares in the 4th working management plan, then 43 percent of the forest available for management activities has been logged.

Of the 43 percent logged, a review of forest cover maps reveals that most of it was the prime valley-bottom forests containing the largest and most profitable trees. As a consequence of targeting the valley-bottom forest, individual cutblocks ranging in size from the post-1985 8 hectare average (Economic and Engineering Services, 1991, p. 17) to cutblocks of up to 116 hectares (logged in the Coquitlam watershed in 1973) have joined together to form continuous clearcuts in all of the watersheds. Koop's analysis of forest cover maps and GVWD records shows that between 1964 and 1968 seven cutblocks in the Capilano watershed linked together to form a 169 hectare clearcut; in the Seymour watershed, on the eastern shore of the reservoir, 21 cutblocks, logged between 1962 and 1986, linked together (with the exception of one narrow leave strip) to form a 365 hectare opening; and in the Coquitlam watershed two large cutblocks

3.3.1 the assumptions

3.3.1.1 the decadent forest

GVWD management believe that forests evolve through a succession of stages culminating in a climax ecosystem. They believe that once this stage is reached, the climax forests become more vulnerable to disease, pest infestations and fire. According to the GVWD, this vulnerability ultimately leads to a catastrophic event which destroys the climax forest and starts the succession process once again. In order to manage for this risk, GVWD is replacing the watershed's mature forests with "a more diverse, multi-aged forest that is healthier and better able to resist insects, disease and fire than an unmanaged stand" (Economic and Engineering Services, 1991, p. 22).

3.3.1.2 susceptibility to pest infestations and disease

In support of their claim that the mature forests are susceptible to pest infestations and fire, GVWD cite a hemlock looper infestation during the 1930's which damaged over 1,620 hectares in the Seymour drainage; a balsam whooly aphid infestation in the late 1960's and early 1970's which damaged 2300 hectares of forest; and a phantom looper infestation in 1983-1984 in the Coquitlam watershed (Economic and Engineering Services, 1991, p. 10).

3.3.1.3 the threat of fire

The GVWD believes the forests in the Seymour, Capilano and Coquitlam watersheds are at risk from catastrophic fires which would destroy the forest cover and introduce both ash and sediment into the water supply. According to the 1991 management review, research which looked at soil profiles and tree age suggests that a number of severe fires struck the Seymour watershed around
1690, 1840 and 1890; and the Coquitlam watershed around 1540, 1690, 1790, 1860 and 1890, "although the extent of the fires is not known" (Economic and Engineering Services, 1991, p. 10). Definitive data on the Capilano watershed is not available.

Due to the perceived risk, prevention of fires is a primary objective of the watershed management program. According to the 1991 management review, a consequence of preventing fires is "the development of old growth forests that contain very high fuel loads. Given the probable high fuel loads in portions of the watershed, it is only a matter of time until the right combination of weather and fire source meet to create a catastrophic fire. Although this will be a rare event--possibly once in 500 years--the chance is not zero and the impacts on water quality will be significant" (Economic and Engineering Services, 1991, p. 11).

In order to manage this risk of catastrophic fire, the GVWD has been logging the old-growth forests in order to replace them with "a more diverse, multi-aged forest that is healthier and better able to resist insects, disease and fire than an unmanaged stand" (Economic and Engineering Services, 1991, p. 22). The "decadent" old growth stands are logged and replaced with "thrifty" young stands. Roads constructed to log the "decadent" forests are also justified as providing ready access to fight any fires that do occur.

A 1991 review of the GVWD management program found that while fuel management was the justification for the watershed management program, the GVWD was not using any specific fire modeling system to guide their activities. The review found that their management program was based on "a 1960s forest management philosophy which must be updated" (Economic and Engineering Services, Public Input Document, 1991, response to submission #57, p. 3).
3.3.1.4 natural erosion processes

The introduction of sediment to the region's water poses a health hazard. With no filtration facilities, the sediment is carried throughout the GVWD water system. Sediment in the water system reduces the effectiveness of the chemical treatment used to kill microbiological organisms, which necessitates increased dosages. GVWD argues that natural sedimentation process will always be present in the watershed whether there is any human management activities or not. In order to manage for the natural sedimentation, GVWD management believe roads are necessary to access the site of any landslide in order to clean up or prevent debris from entering the water system.

3.3.1.5 human ability and need to intervene

GVWD management believes that natural state of watersheds can be improved upon by human intervention. They believe they understand the natural processes well enough to make decisions which will improve the long term health of the region's water supply, while enjoying the incidental benefit of income derived from selling the old growth timber. Based on their understanding of the natural processes and the consequences of their interventions on those processes, GVWD management believe that there is a greater risk to water quality from leaving the watersheds alone than there is from managing them. The 1991 management review supported this notion by recommending the GVWD continue with a proactive management regime (Economic and Engineering Services, 1991).
3.4 EVOLUTION OF GVWD WATERSHED MANAGEMENT

3.4.1 sustained yield forestry

As discussed in chapter two, the theory of sustained yield forestry was promoted by foresters in the provincial forest service as a means of ensuring the perpetuation of a resource that was being raked over by an aggressive industry. The theory was embraced by industry because it secured long-term tenure rights. And the theory was accepted by politicians looking to increase provincial revenues from the forest resource.

The theory of sustained yield forestry is simply that the annual volume of wood cut should be equal to the volume of the year's growth. The volume cut is taken from slower growing mature trees while the volume grown is calculated from the faster growth rate of young trees. Professional foresters developed the expertise to maximize the growth rate of what they refer to as thrifty young stands, which in turn allow a greater volume to be harvested from the mature stands. It was thus optimistically thought that the state of the original forests could be improved upon and the forests converted into a crop with a steadily increasing yield. The management objective for the young stands is to put on the most volume in the least amount of time. Once the growth curve levels out, the forest is not considered to be in a maximized productive state, so the trees are cut once again. The length of time trees take to reach this optimal state is called the rotation. In order for the sustained yield theory to work, accurate estimates of the growth rate must be made. This is difficult, if not impossible, to do on an old growth forest due to the wide variety of species and growth stages present in any given stand, and the variables of climate and soil condition. Given this difficulty, the first step of sustained yield management is to "liquidate" the old
growth forest so that trees of the same age class grow and are cut according to the ideal rotation.

Logging of the old growth also serves to eliminate "over-mature" trees which have developed various forms of decay or rot, affecting the quality of the wood. According to the industrial perspective, trees that are overmature should be replaced with thrifty young trees and trees that are mature should be logged before they reach the overmature stage and are no longer useful for the production of wood products. From a timber perspective then, the forests become decadent when the wood decays, which, as research into the biological functioning of forests reveals, has no detrimental impact on the forest ecosystem itself, it is simply another stage of its evolution (Franklin, 1988; Maser, 1988).

3.4.2 sustained yield and watersheds

In 1924 Professor H.R. Christie, the first faculty member of the University of British Columbia's Department of Forestry (Smith, 1990, p. iv), called for the application of sustained yield forestry in the GVWD watersheds (Kahrer, 1988, p. 134). Christie believed that to preserve the watersheds was an unacceptable waste of the resource: "the policy should be to use all the timber rather than to lock it up for fear of possible damage to the watersheds" (as quoted in Kahrer, 1988, p. 134). Christie also argued that the watersheds would make an ideal research area for his department (Kahrer, 1988, p. 134), a theme which was to arise on numerous occasions in the years to come. Christie's appeal for sustained yield management was shelved with the creation of the Greater Vancouver Water District in 1926. Under the direction of E.A. Cleveland, the GVWD was opposed to all logging in the watersheds because of the impact commercial logging had had on the Capilano and Seymour watersheds during the previous twenty years.
This "no logging position" was maintained by the GVWD until the years following Cleveland's death in 1952.

In 1948, four year's prior to Cleveland's death, the province officially adopted the concept of sustained yield management in the Forest Act of 1948. In 1952, the application of sustained yield management theory to community watersheds throughout the province was endorsed in a resolution passed at the British Columbia Resources Conference, an organization representing industry, university and government. The Conference's objective was to "promote integration and co-ordination of resource development" in British Columbia. The 1952 conference, the fifth one held, was attended by 300 leaders from the three sectors. At the close of the Conference the following resolution was proposed by A.J. Saunders, a Victoria-based consulting engineer, and carried by those in attendance:

Whereas the primary purpose of watershed areas, where surface water is impounded for domestic and industrial water supply is the production of a continuous supply of water; and

Whereas controlled watershed use, rather than the maintenance of full virgin forest canopy, has advantageous values for water supply development; and

Whereas the controls and protection required for the water supply against potential or actual sanitary and fire hazards and erosion are required, whether logging is or is not practiced; and

Whereas conservation means management of a resource and, in the perpetuation of the forest resources, places emphasis on forest management on a sustained yield basis; and

Whereas endorsement of the plan by those best qualified to judge, i.e. professional engineers and foresters and other professional men concerned with the resources of a watershed, is tantamount to guaranteeing that the plan provides for all the factors that govern proper use of the land;

BE IT RESOLVED that this Conference endorses a programme of forest management on a sustained yield basis for watershed lands where surface water is impounded for domestic and industrial water supply (British Columbia Natural Resources Conference, 1952, p. 336).
As shown in this resolution the attitude of the day was one of the need for intervention by "experts," and of profound confidence in their ability to improve upon nature. That the resolution was passed by a body representing industry, government and university is a testament to the alignment of the three groups, and the forest industry's ability to define the interests of British Columbia.

Following the death of Cleveland, Theodore Berry was appointed commissioner of the GVWD. Berry, in October of 1953, hired the politically connected forestry consultant firm, C. D. Schultz and Company, to conduct a survey to update forest cover maps of the watersheds. In February of 1954 Schultz and Company completed their "Preliminary Analysis of Watershed Management for the Greater Vancouver Water District" outlining the necessary preparatory steps for a watershed management program based on the harvesting of timber. Over the next year the Company proceeded with field work in the watersheds, trips to examine other watersheds and their management plans, preparation of a management plan and preparation of a brief to facilitate changes to the existing lease which would allow for logging to take place.

While Schultz and Company was formulating a new management philosophy, Berry was fighting a challenge from the recently elected Social Credit government's Highway Minister, Phil Galardi, to construct a highway to Squamish through the Capilano Valley. In a report dated February 15, 1954, Berry detailed the Water District's opposition to any road construction in the watershed. Among his concerns: an increase in sedimentation from cut and fills associated with the construction of a road; the persistence of turbidity once introduced to a reservoir; an increased danger of fire associated with human presence in the watersheds; and the likelihood that road access would "encourage logging operators to seek cutting rights in the upper part of the
valley...a programme that should perhaps not be undertaken for years, if ever" (Berry, 1954, p. 27) Regarding the sedimentation, Berry argued that it would likely necessitate chlorination of the water 100 percent of the time (an increase from their existing practice of chlorinating only as needed, about 50 percent of the time), and the construction of filtration facilities. The combined cost of chlorination and filtration, he argued, would far outweigh the benefit of constructing the watershed highway. After reviewing specific hazards to water quality he concluded:

It has been charged by some people, who in most cases are motivated by self interest, that the policy of the Water district since its inception in keeping the area isolated from travel and recreation has been one of extreme caution by "over zealous officials." The answer to this irresponsible suggestion is that in the twenty-eight years of administration of 225 square miles of watershed area, the District's assets have been preserved from pollution and loss by fire. It has been suggested also, that some "compromise" should be available. There is no compromise with a burned-out valley or a polluted water (Berry, 1954, p. 29-30).

As Koop's (1993) research found, the Schultz final report was to be delivered to the Water Board in November of 1955, however an unusually heavy rainstorm precipitated flooding and erosion in the watersheds, highlighting the politically sensitive nature of the proposed policy changes:

1) In view of the North Shore Floods of the past week it was felt that it would be inadvisable to present to the Greater Vancouver Water Board the report in which is mentioned the cutting of timber. Those members of the Board not familiar with flood control through multiple use and proper cutting methods would be influenced by recent conditions and probably view the report in a negative light.

2) The report should be reviewed carefully and where possible stress the fact that floods need not result from proper cutting.

3) Present public relations efforts should be directed towards educating all concerned with the fact that there can be flood control through proper cutting and the multiple use of the watershed for water yield and timber
(Memo from C.D. Schultz to Commissioner Berry, November 1955, as quoted in Koop, 1993, p. 39).

Thirteen months later, in December of 1956, C. D. Schultz and Company tabled their revised two volume report entitled "Appreciation of Factors Affecting Watershed Management on the Watershed of the Greater Vancouver Water District." While admitting that the data on which they were able to evaluate the hydrological impact of forest management is "meager", the report established the framework for a management plan that would "develop" the forest resource in an orderly manner that would not affect water yield or quality. They stated that "forests can be a liability to watershed management," and that "a mature forest is ideal fuel for a fire which could destroy in a day the favourable soil conditions that were built up over centuries" (C.D. Schultz, 1956, p. 124). Thus the fire threat a mature forest represents to water quality necessitated the removal of all obvious hazards such as diseased or dead wood and logging of "mature and over-mature" trees before they too became a forest hazard. As part of the management plan logging would be conducted on a sustained yield basis which would provide the ultimate goal of "continuous production from a forest" by balancing the annual production with the annual net growth. In order to facilitate the "rapid succession of fire in any part of the watershed," the report recommended constructing a network of roads, which would also be used as access to cutblocks (Koop, 1993, p. 30).

Understanding the public's wariness about logging in watersheds which for 30 years had maintained a hands off policy, the report stressed that "the ultimate success of watershed management programs is dependent upon public understanding of the problems and objectives" (C.D. Schultz, 1956, p. 121). Concern over public perception of management practices is a concern which appears repeatedly over the years of the management debate.
The terms of the original 999 year lease did not allow for forest management practices. This was noted in the Schultz report, along with the recommendation that the lease be renegotiated "so that a comprehensive Watershed management plan can be initiated" (C.D. Schultz, 1956, p. 137). In February of 1963, Commissioner Berry submitted a brief to the provincial Minister of Forests requesting amendments to the original lease which would allow for scientific management of the forests. The following excerpt from Berry's letter accompanying the brief indicates a significant change in GVWD management philosophy:

Dear Sir:

To permit the Greater Vancouver Water District to protect or improve the quantity and quality of water presently supplied to 800,000 people and eventually to probably 3,000,000 people and to create income for the people of British Columbia from an otherwise wasting asset, it is strongly advocated that a scientific program of management of the forests within the watersheds be encouraged by appropriate amendment of the terms of the existing 999-year Crown leases. The program, on a perpetual basis, would include removal of mature, overmature and diseased timber, reforestation and afforestation, construction of access roads for fire suppression and the progressive development of a young and thrifty forest. It would be conducted with the prime purpose of safeguarding and improving the water supply (Berry to Williston, February 6, 1963).

The brief outlined an argument for the "dual use" of domestic water supply areas which would enable them to produce the renewable resources of both water and timber. This dual use approach was persistently advocated by Allen E. Thompson, the forester responsible for the management of Seattle's domestic watershed, and an individual consulted by the Schultz Company during their review of the Vancouver watersheds. Thompson met with Berry in 1955, traveled to Vancouver to lecture on Seattle's approach to watershed management. This approach was also supported by George S. Allen, the Director of Research for the Weyerhaeuser Timber Company (which was logging the
Seattle watersheds), and the former Dean of the faculty of forestry at University of British Columbia. Allen was quoted in the brief to Williston as saying "In the long run, wise use and good protection of watershed forests will be more economical and safer that a policy of non-use" (GVWD Brief to Williston, Feb. 6, 1963, in Economic and Engineering Services, 1991, Appendix C), a position he argued for while Dean of the faculty of forestry, which matched that of Thompson and which was promoted in the Schultz report.

The rationale for forest management program as presented in the brief to Williston was based on the assumptions that: 1) the forests were overmature and consequently subject to disease and insect infestations; 2) that logging was essential for, and beneficial to, the maintenance of water quality; 3) and that given the above, it was socially unacceptable to forgo the economic gain from logging the forest before it decayed. The brief detailed the balsam woolly aphid infestation and an earlier infestation of hemlock looper which affected the Seymour watershed in 1930 as evidence of the tenuous condition of the forests. As evidence of the viability of a scientific management program, the report cited a review of the Seattle watershed management activities which concluded that:

Controlled watershed use rather than maintenance of full virgin forest canopy has advantageous value for water supply development. Such controlled watershed use has collateral timber production values, which are in no way incompatible with watershed use for water supply development. A program of sustained yield logging is recommended for future use on the watershed. (GVWD, 1963, p. 9)

While acknowledging that Vancouver's watershed catchment areas were steeper than those in Seattle and thus more prone to damage from erosion, the brief used this point not as evidence of the increased danger of erosion from logging activities, but as evidence of the vulnerability of fire removing the forest cover--
thus strengthening their argument for forest management activities, while minimizing the risk of the intervention itself.

In order to improve upon the natural condition of the watershed forests, the brief set out the following objectives:

Controlled gradual removal of the dead, dying, overmature and mature timber and its replacement with a young and thrifty forest would materially reduce the hazard to the watersheds from fires and also maintain and probably improve the water regulating properties of the watersheds.

Roads properly designed and constructed for permanent use would allow rapid access to all parts of the watersheds for fire suppression. They would also allow access for erosion control and the periodic thinning of immature stands to utilize the full potential of the growing capacity of the soil and maintenance of forest conditions consistent with the aims for maximum recovery of precipitation.

The cropping of dead, dying, overmature and mature timber and the periodic thinning of immature stands done in a manner consistent with the fundamental principles of scientific water production would be a prudent use of an otherwise wasting asset that should be utilized as an added resource in the economy of the province.

(GVWD, 1963, pp. 8-9)

To finance the watershed management plan, the brief proposed that the original lease be amended to permit funds from the sale of timber to be used, after payment of statutory royalties to the Crown, to cover the costs of the logging operation, forest protection, reforestation, and "costs of improvement, maintenance and operation of the water supply system whether within or without the leasehold area"(GVWD, 1963, p. 13), thus tying together the ability of the GVWD to maintain its system with the revenue generated from logging.

On March 7, 1967 the provincial government signed an Amending Indenture to the original lease. The Amending Indenture established the principle of sustained yield management "for the purpose of developing, protecting and improving the water-yielding characteristics of the lands by growing continually successive crops of forest products to be harvested in
approximately equal amounts or periodic cuts adjusted or equal to the sustained yield capacity of the lands..." (British Columbia, 1967, p. 2).

3.5 CONCLUSIONS

As this chapter has shown, the GVWD adopted a management theory promoted by the industry complex as being beneficial to water quality. The sustained yield theory was by no means the only one available for managing water quality. In fact, for over 30 years prior to its implementation, the GVWD managed the watersheds by adhering to a policy based on the belief that the natural systems of the watershed were self-sustaining, and that logging would prove to have a detrimental impact. With the death of this approach's strongest advocate, Commissioner Cleveland, the GVWD was subject to the influence of watershed management ideas promoted by the industry complex. The political and economic influence of the industry succeeded in both encouraging the development of the expertise and the adoption of the theory at a policy level. Concerned primarily with the production of timber, the theory was used by both government and industry to justify logging in watersheds throughout the province.

The majority of research on the impact of logging and road building in watersheds with similar topography and climatic conditions has shown an increased rate of erosion and the production of sediment. Despite this research, and despite the lack of hydrology knowledge admitted in the Schultz report, the GVWD adopted and continues to hang on to the assumptions guiding sustained yield management, citing research which claims no connection between their activities and turbidity. As I have argued, the research used by the GVWD to maintain their management perspective is the product of bias for industrial
forestry. Begley, writing on fraud in science, observes that bias is an unacknowledged but widespread condition in research.

Scientists are expected to come up with results, and work within a framework, useful to their patrons—useful not only in an economic sense but also in the sense of a world view. The fraud...enters when the scientists do not stray outside the assumptions of the funder. I do not charge that the scientists’ bias is intentional; it is, rather, inherent, even unconscious, and need not have anything to do with money: someone “proving” the failure of integrated pest management in a study funded by a petrochemical firm is not necessarily bought, but rather found by those looking for kindred spirits [emphasis added]. (Begley, 1992, p. 70).

The GVWD has been guided by "kindred spirits" since their watershed management program was introduced in 1956. The Schultz company was the province's most influential forestry consultancy. GVWD's management program was directed by professional foresters since it was started. The definition of the area available for logging was maximized by the application of a new model for classifying watershed lands—a model developed by a forester. The hydrology research used to justify logging was conducted by a professor of forestry who believes that "good watershed management requires good forest management, and good forest management includes clearcutting" (Douglas Golding, October 11, 1990. Letter to the editor, Vancouver Sun). The 1991 Greater Vancouver Watershed Management Evaluation and Policy Review was directed by consultants with either forestry backgrounds or strong industry connections. All of this research was based on assumptions defined by the needs and practices of industrial forestry, and, from that perspective, endorsed road building and logging in the name of maintaining water quality.

As we saw from the second chapter of this study, policy is influenced by economic and political power. As this chapter has shown, the industry complex succeeded in promoting both the science and expertise of watershed
management which served their economic interests. With the importance of science in the setting of policy, industry influence over the definition of good watershed management provided a rationale for the logging of community watersheds. As we shall see, this rationale was essential to minimize opposition to the watershed management policy. As the fourth chapter of this study will show, within the changing context of environmentalism, public debates began to focus on challenging the science.
CHAPTER IV.
PUBLIC PARTICIPATION, ENVIRONMENTALISM AND RENEWED DEBATES ABOUT WATERSHED MANAGEMENT

4.1 INTRODUCTION

After reviewing the evolution of the watershed management debates, this chapter focuses on the period between 1988 and 1992. In an era of rising concern for environmental degradation, a fundamentally different way of looking at the science of watershed management rekindled a debate which had been dormant for over thirty years. These new critics of the GVWD management program, adopting an environmentalist's value system, challenged the underlying assumptions, the quality of the research used to support them, and the conclusions drawn from the available data. In addition, they demanded input into the policy making process. As a result of increasing pressure, the GVWD initiated a formal public participation process to elicit comments on a review of their watershed management policy and practices.

4.2 EVOLUTION OF WATERSHED MANAGEMENT DEBATES

The debates over GVRD watershed management date back to the early years of the century. While the issues have been remarkably consistent, the fora for the debates have changed considerably. The evolution of the debates can be divided into four distinct periods, with this section of the chapter concerned with the first three. During the initial period, from 1887 to 1925, the debate illustrates the struggle between municipal government's interest in maintaining water quality and the provincial government's interest in maximizing their revenue from issuing timber leases in the watersheds. The second period, from 1926 to
1952, is characterized by municipal control of the watersheds and their "no logging" policy. The third period, from 1953 to 1988, illustrates the influence of the industry complex, which, having developed watershed management expertise, was able to reintroduce logging into the watersheds. The fourth period, from 1988 to 1992, reveals the tension between rising concern over environmental degradation and the industry complex. During the first three periods, the debate was primarily between government agencies, politicians and the forest industry. Aside from one electoral ballot, there was no formal public participation in management of the watersheds. This contrasts with the latest period of conflict, when demand for public input into the definition of "good" watershed management became central to the debate—a point to be discussed later in this chapter.

According to Kahrer's (1988) research into the history of logging on the North Shore, logging began its steady incursion into the region's forests with the construction of the first sawmill in 1863. In 1870 the Moodyville Sawmill Company acquired extensive leases for land near the mouth of the Capilano and Seymour Rivers. By 1875 easily accessible high quality timber was already becoming scarce at lower elevations and skid roads were being pushed up to 4 kilometers inland (Kahrer, 1988, p. 32). In 1886 construction started on a road accessing the upper reaches of the Capilano river to build a water system supplying the city of Vancouver, which was located on a peninsula of land without water. By 1889, water flowed through 16 kilometers of pipe from an intake to city tap. In early 1902 a consortium of logging companies proposed logging in the valley and transporting cedar shingle bolts on a flume—which was thought to be the most economical means available. They wanted to build a flume covering almost 14 kilometres—from above the city's water intake to the waters of Burrard Inlet (Kahrer, 1988, p. 43). Concerned about the impact of both
the flume and logging on water quality, their plan was initially opposed by Vancouver's city council. However, with assurances from the logging companies that measures would be taken to maintain water quality, construction of the flume proceeded (Kahrer, 1988, p. 59).

In November of 1905, just a few months prior to the opening of the flume, Vancouver's Mayor Buscombe proposed that it was vital for the city to acquire all the land and timber above the intake in the Capilano Valley, and urged the provincial government to establish a 999 year lease for the city (Kahrer, 1988, p. 126). This request was rejected because the government was trying to stimulate the economy by promoting the forest industry (Kahrer, 1988, p. 126). During the same period, changes to the provincial legislation governing the allocation of timber leases in 1905 led to a rush of speculators staking and buying up existing leases.

In 1905, Vancouver's Mayor Buscombe also advocated that the Seymour River be secured as a second source of water for the rapidly growing city of Vancouver. After the results of a engineering survey confirmed the feasibility of the Seymour River supplying domestic water, the municipalities of North Vancouver, Burnaby, South Vancouver and Richmond became embroiled in a competition to secure water rights. While these municipalities negotiated amongst themselves, timber licenses were issued by the Provincial Government to speculators for areas of the Seymour Valley above the proposed water intake. Responding to pressure to restrict uncontrolled logging in the watershed, in September of 1906 the Provincial Government placed a reserve on the remaining Seymour Valley forests (Kahrer, 1988, p. 127).

The third source of water for residents of the Greater Vancouver is the Coquitlam Watershed. The Coquitlam was first tapped to supply water to the city of New Westminster in 1886 by the Coquitlam Water Works Company
According to Koop's (1994) research, in 1898 the Coquitlam Lake was identified as a potential site for the generation of hydro-electric power by the British Columbia Electric Railway Co., which then created a subsidiary, the Vancouver Power Co. (VPC), to pursue the project. By 1902, the VPC purchased the Charter of the CWWC and took over responsibility for supplying water to New Westminster. After a few months of lobbying the federal, provincial and municipal governments, the VPC was granted, by order-in-council, the right to divert water from the Coquitlam lake for the generation of electricity. With the backing of British capital, the VPC embarked on their plan to raise the level of the Coquitlam Lake by five feet through the construction of a dam; construct a tunnel, 2.4 miles in length, connecting Coquitlam Lake and Lake Buntzen; and build a generating plant 400 feet below Lake Buntzen on the shores of Indian Arm which, through massive pipes, the Coquitlam water would flow.

In 1905, Ironside, Rennie and Campbell, a logging company involved with the construction of the tunnel proposed logging in the Coquitlam watershed. VPC management objected to the logging believing that it would increase the risk of fire, reduce annual precipitation, cause the early and sudden melting of the snowpack—which would introduce debris into the lake, and ultimately defile water quality. (Koop, 1994, p. 6) The logging company lobbied the provincial government, which in January of 1906 put 12,200 acres of the upper Coquitlam watershed up for tender, only to reverse its decision at the insistence of the VPC. (Koop, 1994, p. 7). Following a change from provincial to federal jurisdiction over the watershed lands, the federal government passed an Order-in-Council in March of 1910 designating 56,000 acres in the Coquitlam as a forest reserve. The purpose of the reserve was to conserve and protect "the forest cover on all land draining into Coquitlam lake in order that the run-off may be gradual and constant"(Canada Gazette, March 19, 1910, P.C. 394, p. 2772). No such Order-in-
Council was passed for either the Seymour or Capilano watersheds, and the debate over logging continued to be waged with representatives from municipal and provincial agencies arguing for the preservation of the watershed forests.

In 1914, the provincial department of Lands' Water Rights Branch issued a report upon surveying the Seymour and Capilano emphasizing the importance of keeping the forest cover intact:

The preservation of the forest-growth to the watershed is necessary for several well-known reasons, some of the more important being: (1) That the tall trees retard very materially the spring melting of the snow; (2) that the forest and ground vegetation maintains a normally low temperature in summer, preventing excessive evaporation and keeping the ground well saturated with water; and (3) that the forest-growth prevents erosion and quick run-off on steep slopes. Where timber is removed the soil is very quickly washed off, leaving bare mountain-sides off which the precipitation rushes almost as it falls; causing sudden dangerous floods laden with great quantities of sand, gravel, and organic matter, rendering water unsatisfactory for domestic purposes. (As quoted in Koop, 1993, pp. 6-7)

In 1917 Vancouver's city engineer expressed concern over logging in the watersheds, arguing that: "No private interests should be left above the intakes of the water supplies, because no matter how valuable those interests may be, those of the public in the water supply are paramount" (F.L. Fellowes, March 30, 1917. Letter to the editor, Vancouver Province). In 1922 E. A. Cleveland, the provincial Comptroller of Water Rights and consulting engineer of the Provincial Lands Department conducted a detailed survey of the Capilano and Seymour watersheds commissioned by the Minister of Lands, T.D. Pattullo. Cleveland argued that the watersheds' most valuable asset was their ability to provide a pure water supply. He concluded that the water supply was at risk from logging in the watersheds and recommended that all logging be phased out and the land be put under the direction of a water board. To Cleveland, the
greatest threat to the integrity of the watersheds was from fire traveling through the logging slash and consuming the upper soil layer, thus exposing the unproductive subsoil, which in turn would be swept into the water system. Not only would this cause turbidity, the loss of topsoil would also prevent regrowth of vegetation, accelerate erosion and remove the natural water filtration the forest floor once provided. Cleveland believed that the probability of a fire occurring was unacceptably high:

It may almost be said that fires have in the past been one of the inevitable results of logging. The extreme care exercised nowadays in logging operations to prevent fires and the improved methods of fighting them give some hope that such grave fears will not be realized in the operations under consideration but assurance of safety is impossible. The Capilano Lumber Company is now prudently leaving strips of standing timber a half mile or so in length along the valley and extending across it and up the adjacent hillsides to serve as fire breaks. The configuration of the valley and the surface conditions in the logged-off area, however, invite a conflagration. Should such a disaster occur the lesson will have been dearly learned (Cleveland, 1922, p. 89).

Despite the recommendations Cleveland made in his 1922 report to the Minister of Lands, in the summer of 1924 Pattullo still wanted to issue more timber leases in the Capilano watershed, above the city's water intake. This created considerable controversy in Vancouver over the provincial government's desire to prioritize revenue generation over the protection of the water supply for British Columbia's largest city. The issue escalated to the point where Charles Woodward, the city's Member of the Legislative Assembly threatened to resign if the lease was granted. The Premier's direct intervention resolved the conflict in December of 1924 and the timber leases in question were subsequently issued to the city of Vancouver.

The following summer the conflagration Cleveland warned of occurred. Starting on June 25th, 1925 and lasting through to September 1st, a fire attributed
to logging operations burned an estimated 3,213 acres of Capilano watershed land (Koop 1993, 20). With the fire as dramatic support for his concerns and recommendations, and with the political heat generated by the previous year's controversy over the allocation of cutting rights, the Greater Vancouver Water District (GVWD) was formed, with Cleveland at its helm.

Cleveland remained commissioner of the GVWD from its inception in 1926 to his death in 1952. As detailed in Chapter Two, Cleveland's successor was successfully targeted by the timber lobby, through Schultz and his associates, to adopt sustained yield management in the watersheds. Without the municipal government's opposition to logging, a change in management philosophy proceeded without challenge.

In 1967, with the Amending Indenture in place, the GVWD began gearing up their operation for sustained yield logging. Not yet having a forester on staff, the GVWD contracted the services of K.C. McCannel, a former employee of the Schultz Company, to prepare interim plans until a complete five year working plan could be drafted. For McCannel the watersheds offered the opportunity to "demonstrate the economics of multiple purpose" forest management (as quoted in Koop, 1993, p. 50). In the media accounts of the day, the GVWD water Commissioner was quoted as saying that logging would only be slightly increased under the new management regime (Vancouver Sun, February 16, 1967, p. 3). In the first year of the sustained yield program the volume logged increased by 50 percent to 17,000,000 board feet (Greater Vancouver Water District, Minutes of the Administration Board. March 3, 1967, p. 4).

Shortly after the implementation of sustained yield management, the GVWD entered into a hydrology research project with the University of British Columbia's Forestry Faculty. In June of 1968, GVWD held discussions with Dr. Walter Jeffrey, associate professor of forest hydrology, about funding a long term
study on the hydrological impact of logging in the watersheds. In 1968 Jeffrey was the only forest hydrologist in British Columbia, and the only individual this study has identified speaking from a professional capacity against the state of watershed management in British Columbia. Jeffrey's (1968) review of watershed management problems in British Columbia found that most watershed management was being guided by foresters whose education and professional mandate was directed exclusively towards timber management. This, he found, was leading to degradation of watersheds throughout the areas of the province his study covered. Furthermore, he found that "watershed management has suffered almost complete neglect in B.C. and little directly pertinent, published material is available" (Jeffrey, 1968, p. 58). In a presentation to wildlife and fisheries biologists in February of 1968 he argued that "it is illogical, unfair and dangerous to expect an industrial concern, whose economic survival is dependent upon one resource, to manage delegated public lands for a products-mix maximizing human benefits for society as a whole" (Jeffrey, 1968b, p. 10). He strongly recommended that research be initiated promptly to mitigate the expense of restoring damaged watersheds.

The GVWD research project was initiated because, as their staff stated seven years after commencing logging in the watersheds (logging which was promoted, designed and implemented by industrial foresters), "the effects of forest cover removal on water production are not known for this area and cannot be reliably predicted" (GVWD, minutes of the administration board. January 30, 1969, p.7). The GVWD research project proposed to monitor one sub-drainage in the Capilano watershed for a period of ten years. In January of 1969 the GVWD agreed to pay $10,000 annually from the proceeds of logging, with additional support coming from U.B.C. and the National Research Council of Canada (GVWD, minutes of the administration board. January 30, 1969). Dr.
Jeffrey was killed in a helicopter accident in August of 1969. The following year Dr. Douglas Golding, a recent graduate of U.B.C. Faculty of Forestry, took over the research project. Research started in 1971 at Jamieson Creek, a 300 hectare drainage basin within the Seymour watershed.

Just as the hydrology research was starting up, the watershed inventory was completed by December of 1969, and in 1970 the GVWD produced their first five year management plan. This management plan focused on continuing the salvage program and creating an infrastructure of roads throughout the watersheds. It set the AAC at 141,760 cubic metres of wood on a harvestable land base of 34,878 hectares (Economic and Engineering Services, 1991, p. 23). Under the direction of this management plan the Coquitlam watershed was, for the first time, targeted for logging. In the fall of 1971 construction started on a logging road along the east side of the Coquitlam lake where, according to the GVWD, a western hemlock looper infestation necessitated the clearcutting of the affected forests.

The second management plan was submitted in 1975, and, based on research which indicated logging certain areas may not be compatible with maintaining water quality, the harvestable land base was reduced by almost half to 18,451 hectares, while the AAC was reduced by 11,010 cubic metres to 130,700 (Economic and Engineering Services, 1991, p. 23). This management plan established a logging program which had evolved from the salvage operation to a commercial sustained yield regime. At the same time the GVWD was moving towards a commercial logging operation in the watersheds, the provincial government released its 1976 Royal Commission on Forest Resources, which noted that the Vancouver and Victoria area watersheds "contain some of the last remaining stands of old-growth timber within easy reach of these population centres and a strong case can be made for preserving examples of these stands for
public education and enjoyment” (Pearse, 1976, p. 186). GVWD’s response to this suggestion focused on the need to keep the watersheds closed to preserve water quality. Their response also claimed that “for the most part, the watershed lands, or at least the accessible parts, were logged off by the early part of the 1920’s. Thus there are no stands of old growth timber accessible to the public even if they were permitted into the watersheds” (GVWD Engineer’s report, Minutes of the Greater Vancouver Regional District Board Meeting. March 23, 1977, p. 9).

While there was logging in the Capilano and Seymour watersheds during the early years of the century, the Coquitlam watershed was essentially untouched until the GVWD started logging in 1973, and at the time of the report the upper Coquitlam valley was pristine.

Following the release of the second management plan the MOF responded negatively to the reduction in the AAC. MOF staff felt the reduced AAC was based on “very conservative” guidelines, which they challenged the GVWD to justify. The Chief Forester, in a letter to the commissioner of the GVRD, reminded that the GVWD that they were "consistently undercutting" and consequently not in compliance with either the terms of the Amending Indenture, or the practices of good forest management (Letter from E.L. Young, Chief Forester, Ministry of Forest to F.R. Bunnell, Commissioner, GVRD. June 8, 1976. MOF Regional Archives). In response to MOF pressure to both meet the existing AAC and justify why it shouldn't be increased, Bunnell acknowledged that:

"...The Forestry Service is interested in optimizing the use of the lumber resources of the Province and for this reason insists on sustained yield utilization. Since seven-eighths of the watershed lands are owned by the Province, it is obvious who has the ultimate control of the program. (GVRD Commissioner's Comments, Waste and Water Committee Agenda Minutes, July 19, 1978, p. 2)"
In 1980, with the submission of the third management program, the GVWD responded to the MOF pressure and made it clear that preservation of the watersheds was not part of their plans. The land base available for logging was expanded by almost 30 percent to 26,386 hectares, while the AAC increased by a proportionate amount to 200,000 cubic metres. According to the new Aqua-Terra Classification System developed as the Ph.D. project of a student at UBC's School of Forestry, the watershed forests were reclassified, resulting in the significant increase in land designated as suitable for logging. The following year, in 1981, the Provincial government's Environment and Land Use Committee of Cabinet released a report supporting the value of preserving the Coquitlam watershed forests as a wilderness, stating that GVWD plans for road building and logging in the upper Coquitlam River Valley should be re-assessed (British Columbia, 1981, p. 80).

On October 31, 1981 a major storm passed through the region triggering landslides and producing, for the first time on record, turbidity in all three watersheds (GVRD Administration Board Minutes, November 26, 1981). The same storm also washed out the highway joining Vancouver to Squamish, which in turn triggered yet another call to construct a highway through the Capilano valley. The GVWD maintained their opposition to the highway arguing once again that the region's water supply would be jeopardized by public access through the area. During the discussion of both the turbidity event and the highway proposal, there is no record of any discussion of the impact of logging and road construction in the watersheds. In November of 1983 another major storm struck the area, producing turbidity in the water supply. Once again, there is no record of any discussion of the impact of logging and road construction in the watershed.
4.3 RISE OF ENVIRONMENTALISM

The debate over watershed management began to gain momentum following a rise in concern over the impact of forestry on British Columbia’s environment. During the 1950's, 1960's, 1970's and 1980's, the transformation of the province's forests into timber products and pulp for export enriched the lifestyles of many of the province's residents--an increasing percentage of whom were living in urban centres. With greater wealth, and resultant increase in leisure time, the pursuit of wilderness activities increased as city dwellers sought recreation outside of urban centres. As more people got out into the woods, and as the technologically increased harvesting capabilities of the industry cut unprecedented volumes of wood (see Swift, 1983. chapter 3), more people saw more clear cut forest than ever before.

In the early 1970s the combination of affluence, personal experience of the impact of logging and an increase in mediated awareness of environmental problems worldwide resulted in the formation of citizen groups objecting to the industry's practices. On the political front, the official opposition, the New Democratic Party, began to aggressively probe into the workings of the province's forest policy--an area that had received little scrutiny for the previous two decades. As information surfaced on the state of the forest service, the degraded state of the forests, and the escalating rate of tenure concentration, opposition to forest policy and practices began to mount.

In 1972, the election of the socialist New Democratic Party (NDP) interrupted the previous government's cooperative approach to regulation of the forest industry. In order to reformulate forest policy, the NDP initiated a Royal Commission examining the forest industry (Pearse, 1976). The publication of the Commission's report in 1976 marked the beginning of an increasingly informed debate about the state of the province's forests.
Over the past two decades environmental groups gained considerable support, to the point where the provincial government, recognizing the political folly of ignoring their constituency, began to listen to the concerns being expressed. Protests organized by these groups focused attention on demands for the preservation of large tracts of forested land. Through their lobbying and attention generating tactics, the province's environmental groups played a key role in setting aside Meares Island, South Moresby Island, and Carmanah Valley through both political and legal processes.

The environmental movement also focused attention on forestry practices. Massive clearcuts, insufficient replanting, excessive waste of timber, damage to streams and the consequences of careless road construction were among the most apparent of the problems which led to widespread criticism of industry and the government's forest service. The criticisms began to strike at the very core of traditional forestry's assumptions, questioning practices that revolved around the primary objective of economically efficient timber production.

Stunned by the intensity of the criticism they were subjected to, and by the losses to their timber base, the forest industry reacted by launching a public relations campaign, believing the problem was simply one of misunderstanding. This perception was based on the industry's profound confidence in the validity of their forestry practices--confidence that was not widely shared by residents of the province. Consequently, their public relations efforts, coinciding with a dramatic surge in concern for the state of the environment, succeeded in further inflaming resent for, and mistrust in, the forest industry. In 1987 when their campaign was first launched, they "...were hit by a tidal wave of environmental concern" (Coady, 1990, p. 2). In September of 1988, 56 percent of British Columbians named the forest industry, on a top-of-mind basis, as the country's
worst polluter. In April of 1990, after three years of industry advertising, that number had increased to 80 percent (Angus Reid, 1990, p. 12).

In keeping with a tradition of "educating" the public about "good watershed management" practices, the GVWD created the Seymour Demonstration Forest (SDF) in August of 1987. Partially funded by the Council of Forest Industries, the pre-eminent lobby group for the forest industry, the lower Seymour Valley was redesignated as the SDF and opened to the public. The objective of the SDF was to educate the public about good multiple-use forest management, while at the same time providing more recreational land for the expanding population of the Greater Vancouver area.

Along with greater concern for the environment came less tolerance for environmental risks. This coincided with major advances in scientific technologies capable of measuring smaller quantities of toxins, which in turn lead to acknowledgment of previously unrecognized risks. Changing expectations resulted in demand for more stringent legislation and guidelines to control environmental degradation.

With heightened concern for the environment, decreasing tolerance of environmental risks, increased scientific ability to measure toxins and political motivation to address both the problems and the changing expectations, an environmental group, the Western Canada Wilderness Committee (WCWC), was, for the first time since the Amending Indenture was signed in 1967, able to focus public and political attention on the GVWD's watershed management policy. Founded in 1980, WCWC defines their primary objective as saving the province's wilderness areas from "unnecessary development" (WCWC, 1989, p. 2) The group believes that "most Canadians would support greater wilderness preservation and pressure their politicians to act accordingly if they had access to educational materials explaining the importance of wilderness" (WCWC 1989, p.
2). Accordingly, they issue press releases to draw media attention to specific issues, and produce educational reports and books outlining their perspective on wilderness values and land-use conflicts. From a handful of members in 1980, the group experienced rapid growth, peaking with over 30,000 members in 1990. Funding for their activities is provided by membership fees, donations and the production and sale of various products.

WCWC's interest in the management of the GVWD watershed was based on the initiative of Mark Wareing, their staff forester from 1988 to 1993. A former employee of the B.C. Forest Service, Wareing worked as a Resource Officer in Silviculture for the Maple Ridge Forest District for seven of his 21 years with the government. As an employee of the MOF, the agency mandated by the Amending Indenture to monitor and approve logging in the watersheds, he became familiar with the GVWD's management plans. On September 23, 1988, shortly after joining the staff of WCWC, Wareing met with GVWD staff to announce his intent to study the impact of their management program in the Coquitlam watershed. For the purpose of his study, Wareing used a permit given to him as an employee of the MOF to access the restricted watershed lands-a permit which was subsequently confiscated by GVWD security while he was photographing rainstorm run-off. Wareing also requested and received access to the GVWD forest management plans prepared for the Coquitlam watershed. On October 20, 1988, Wareing released his report entitled "Coquitlam Watershed Logging Impacts, an Environmental and Water Quality Study", in which he called for a public inquiry into the impacts of logging and road building in the three watersheds, and an immediate moratorium on road building the Upper Coquitlam River, pending a review of the area's wilderness potential. Wareing expressed particular concern over the road building and logging planned for the west side of Coquitlam Lake, which was slated for an area containing "a highly
erodible landform, as evidenced by the frequency of drainage courses and natural
slides. "Logging and road building in such terrain cannot fail to drastically
accelerate soil erosion and mass wasting events" (Wareing, 1988, p. 7). The
report was distributed to all mayors within the GVRD, and was responded to by
the GVWD at the November 17, 1988 Water Committee meeting. The GVWD
claimed that:

"The District's Watershed Management Program already includes the
environmental thrust of the recommendations. ...The District has
managed the forest in the watersheds on a sustained yield basis for the
purpose of developing, protecting and improving the water yielding
characteristics of the watersheds and the highest priority in the
management of the lands is given to water supply purposes, both in
terms of quality and quantity of water and the provisions of the forest
management plan is secondary to this objective. (GVRD November 22,
1988 agenda, item no. 4. memo from water and waste management
committee meeting of November 17, 1988)

In response to Wareing's charge that logging was occurring on unstable slopes,
the GVWD cited the application of their Aqua-Terra Classification System
(ATCS) as evidence that decisions on where to log are made based on strict
criteria: "This system is the environmental guideline the District has used in all
three watersheds for maintaining water quality as a first priority in our
watershed and forest management program." (Memo from Hamaguchi to
Purdon, November 8, 1988, p. 4)

On October 25, 1988, WCWC issued a press release marking the opening
salvo in their campaign to generate awareness of and concern over logging in the
watersheds. Under the heading "Watershed logging threatens health of 1.5
million people in greater Vancouver," the release went on to say that the agency
responsible for safeguarding the region's water supply was actually threatening it
with an "ill-advised logging operation." The release then set out the themes--
unlogged watersheds delivering purer water, logging related slope failure,
sedimentation making water treatment inefficient, the false economy of logging relative to the expense of filtration, limited access to information, and the urgent need to end the logging—which became central to the debate:

The cleanest and safest water has in the past come from the little-logged Coquitlam watershed while the dirtiest water is drawn from the heavily logged Capilano reservoir. Siltation caused by slope failures in the watersheds is already a major concern to public health officials in municipalities which draw drinking water from crown lands controlled by the Greater Vancouver Water District. The water district has no way to remove silt and organic debris from drinking water, all it can do is chlorinate the water to kill bacteria.

Last week, Rick Bernard, health inspector in charge of water quality for the city of Vancouver, said that organic matter entering the water system is a threat because it hides bacteria that chlorine cannot kill. Should there be an outbreak of giardia (beaver fever) in Vancouver's watersheds, a very real danger according to Bernard, the increased levels of organic matter increase the risk of infection even further.

Should it be necessary to build water filtration systems, the regional district faces a construction cost of about $300 million. Logging in the Coquitlam watershed earned the water district $10 million in 1987.

Mark Wareing, a professional forester who has been studying the problem of water quality degradation for the Western Canada Wilderness Committee, has been ordered out of the Coquitlam watershed by security guards and has had his permit to enter the watersheds taken from him. Wareing has also been denied access to maps showing slope stability problems.

If the situation isn't reversed, Vancouver residents will lose their cleanest source of drinking water. To safeguard our water supply and to preserve some of the finest old-growth forest in the Vancouver area, the Wilderness Committee is calling for a full review of all watershed logging. (WCWC press release, October 25, 1988)

Two months later another WCWC press release drew attention to a mudslide within the Capilano watershed claiming that is was "...definitely the result of clear-cut logging on a steep slope," and calling for a moratorium on all clearcut logging in the three watersheds (WCWC press release, December 15, 1988). The release precipitated a series of high profile newspaper articles in
which Wareing's claims were refuted by GVWD staff. Wareing claimed that he saw the slide starting in 1985, while an employee of the MOF, and that it had expanded about ten times since that time. The GVRD claimed what they refer to as the Healmond slide started in 1975, that it was in no way associated with their logging practices, that it in fact occurred in an area that was not harvested until 1983, eight years after the original slide, and that upon inspection, the area showed no signs of recent slide activity at all. Wareing, in turn, refuted the GVWD claims, saying that the 1975 slide bears no relation in size to the 1988 slide, and that he photographed two other slides in the area, one being as recent as one month old. He also expressed his concern that the GVWD thought it was acceptable to clearcut log steep slopes next to an existing slide, alleging that: "This amounts to a reckless failure to heed nature's warning, and to virtually guarantee the massive extension of the slide that has occurred since the logging" (Wareing to Editor of Vancouver Sun, December 19, 1988).

Throughout 1989, the tone of the debate maintained the animosity between Wareing and the GVWD with the exchange of accusations and counter accusations. Wareing continued his study into the issue and made a number of requests for information from the GVWD, which they only in part filled. He also requested the return of his access card, which was denied by the GVWD on the grounds that it was issued to him as a MOF employee, a status he no longer held and thus had no legitimate business in the watersheds. In March of 1989, the GVWD staff initiated, following the recommendation of a consultant's report examining the District's water delivery system, a review of their watershed management activities and an updated Comprehensive Watershed Management Plan. On May 11, 1989, Wareing made a presentation to the GVWD's Water and Waste Management Committee (referred to as the Water Committee throughout the rest of this report) referring to the Healmond slide
and detailing his concerns over watershed management practices. Responding to his presentation, GVWD staff prepared a memo for the July 13, 1989 Water Committee meeting defending their management practices. They presented extensive documentation of the circumstances surrounding the Healmond slide and the remediation of it, citing an erosion control specialist who concluded that the work on the slide presented one of the most successful rehabilitation efforts in the province (GVRD July 19, 1989 agenda, item no. 2. memo from water and waste management committee meeting of July 13, 1989, p. 5). In September of 1989, Wareing made a request to the GVWD for access into the Coquitlam watershed for the purpose of an inspection. This request was denied by the GVWD stating that a number of research groups have studied the watersheds and that the "Results of these research projects have repeatedly shown that there is no deleterious effect on the quality of drinking water as a result of the watershed management practices" (letter from John Morse to Mark Wareing, October 2, 1989). The GVWD invited the WCWC to submit a detailed research proposal, which could then be evaluated for its feasibility and uniqueness. Having neither the mandate or resources for full-scale research projects, the WCWC declined.

Continuing to pursue the issue, WCWC sponsored a public forum on watershed management held at Robson Square Media Centre on January 18, 1990. A panel including GVRD senior management, University of British Columbia forest faculty, MOF hydrologist and WCWC's Mark Wareing, debated watershed management issues in front of approximately 300 individuals. In response to the attention WCWC was directing at watershed management issues, and in response to the rise in concern for environmental issues, the Water Committee (which was renamed the Water and Environment Committee) directed GVWD staff to prepare a report on their forestry practices. At the March
28, 1990 committee meeting, the Directors passed a motion "That the staff report back through the water and Environment Committee on what effects, if any, the District's current logging practices have on the improvement of water quality" (Minutes for the GVWD administration board meeting agenda, March 28, 1990, p. 2). On July 16th, the GVWD report on their watershed logging was presented to the Water Committee and detailed at length the historical background, the watershed management program and research conducted in the watersheds.

During this same period, a Director of the WCWC, Dr. Ron Abrahams, was actively lobbying the British Columbia Medical Association's Environmental Health Committee on the issue, citing the health threat logging posed to the area's drinking water. The British Columbia Medical Association (BCMA), a professional association representing medical doctors throughout the province, is dedicated to protecting the public health; promoting the science and art of medicine; and improving the conditions and preserve the professional freedom of physicians. As part of their mandate to protect the public health, the BCMA has an Environmental Health Committee addressing issues related to the physical condition of the province. Since 1987 this committee has been actively examining the issue of water quality throughout the province. Dr. Ian Gummeson, who was Chair of the BCMA's Environmental Health Committee in 1991, said the association was concerned about all the watersheds in British Columbia from two standpoints: the first being that no province-wide analysis has been done of water quality--despite the fact that the incidence of waterborne diseases has skyrocketed over the last 10 to 15 years; and the second being that health professionals are not given the authority by the provincial government to direct how watersheds should be managed for water quality (Interview, April 19, 1991). According to Gummeson, B.C.'s watersheds are presently being managed
by "legislation and engineers, not by people who know" about prioritizing health concerns (Interview, April 19, 1991).

In order to formulate a position regarding the management of the Vancouver watersheds, the Environmental Health Committee invited, on March 31, 1990, Mark Wareing from the WCWC and John Morse from the GVRD to present their respective positions on GVWD's management activities. As a result of their deliberations, the BCMA passed, at their 1990 Annual General Meeting, the following resolution regarding water quality:

Be it resolved:
That the BCMA recommend to the provincial and municipal governments of BC that they initiate an independent study of watershed management practices in all major water systems in the province; and
That the focus of such studies be to determine the contribution of agricultural, industrial, forestry, and recreational activities within watersheds on the presence of turbidity, chemical contamination, and pathogenic microorganisms in the water supply prior to its entry into the public water system; and
That as a first step such an independent study be funded by the Greater Vancouver Regional District in the Coquitlam, Seymour and Capilano watersheds, the single largest water supply district in BC (BCMA 1990).

Not only was the controversy over watershed management heating up, but the summer of 1990 was proving to be dryer and hotter than average, resulting in a high fire hazard and low water levels in the watersheds. On the evening of August 10th, a lightening storm passed through the area, resulting in 11 fires in the Capilano watershed. GVWD and MOF resources were used to contain the fires to a total burn area of three hectares. According to the GVWD these fires were all located in old growth forests at mid to high elevations. Helicopter rapid attack crews were used to access the most remote of the fires, while road access was used for the balance. GVWD management used this event
as evidence of the validity of their watershed management program. In a report to the Water Committee, GVWD staff explained:

The greater Vancouver watersheds, like other forested hillsides in the province, are subject to forest fires caused by lightening strikes. The severity of any fire is determined by the forest type, moisture content of the wood, weather conditions and topography. The Vancouver vicinity has a combination of climatic and geographic factors that provide some of the most productive growing conditions for coniferous forests in Canada. Dead or decaying trees which generally dry out faster in dry weather are found throughout the forest canopy and on the forest floor. A relatively low frequency of forest fires in the Vancouver vicinity allows for a greater accumulation of this wood debris compared to other forested areas.

An objective of the GVWD Watershed Management Program is to reduce the potential for a devastating forest fire to develop in the watershed lands by manipulating the vegetation cover into a mosaic of various age classes including young plantations and old growth. This controlled vegetation pattern is designed to reduce the ease of fire ignition and the ability of the fire to spread. The management program also provides road access into most drainages within each watershed to reduce the initial attack response time to fires and to transport personnel and supplies efficiently to the fire (GVWD water and environment committee meeting agenda, item 3. October 31, 1990, p. 1).

During the month of September, WCWC attempted to get the Ministry of Environment (MOE) to prosecute the GVWD for failing to comply with the terms of the Greater Vancouver Water District Act of 1924. They argued that under Section 87 of the Act, it is an offense to "throw or deposit any injurious or offensive matter into the water supply," and under Section 88, it is an offense to "convey or cast, cause or throw, or put filth, dirt or other deleterious thing in any river from which the Greater Vancouver water supply is obtained" (WCWC 1991, p. 2). According to the WCWC, the GVWD introduced materials into the Coquitlam water supply as a consequence of their road building activities at Harmony Creek, and by doing so they broke the law. WCWC submitted an affidavit with details of the alleged infraction to the MOE through the Regional
Crown Council on September 4, 1990. The MOE declined to prosecute saying the enforcement of the Water District Act was not their direct responsibility, and since the penalty for the offense is $50 it was not appropriate for the Ministry to pursue the issue (Letter from Alan Blair, Crown Counsel, Ministry of Attorney General to David Crossin, McCarthy Tetrault Barristers and Solicitors. Sept. 27, 1990).

Also during September, the GVWD released the final summary report examining drinking water quality in the region (Economic and Engineering Services, 1990). The report, written by the same firm conducting a review of GVWD watershed management practices, found that the region's water did not meet all of the Canadian Drinking Water Guidelines. Excessive bacteria levels were recorded in the summer and fall; the chlorine used to treat the water was depleted at the extremities of the system; turbidity exceeded acceptable levels—particularly in water coming from the Capilano watershed; and because high turbidity makes chlorine less efficient as a disinfectant, the water supply was at risk from giardiasis.

According to John Morse, manager of GVRD's water engineering and construction department, the district's water quality had not changed appreciably over the past 30 years, but what had changed was the capacity to test water quality, the standards set by the federal government and the public's awareness of environmental problems. The combination of these factors led to the review of water quality, and the subsequent recommendations for its improvement (City of Vancouver council meeting minutes, October 18, 1990, p. 2). According to Vancouver's City Engineer and Medical Health Officer, the report on water quality improvement was initiated in August of 1984 when they presented to Vancouver Council evidence that the city's water did not meet federal guidelines for bacteriological quality and that it regularly experienced turbidity (City of
Vancouver. Manager's report on drinking water quality, October 4, 1990). The lower mainland's Medical Health Officers then requested that the GVWD look into the problem and present recommendations, which resulted in the September 1990 report. In response to this report, the city's Medical Health Officer recommended that the construction of filtration facilities was necessary in order to meet the federal water quality guidelines (City of Vancouver. Manager's report on drinking water quality, October 4, 1990, p. 4). No mention was made of logging as a possible source of turbidity in either the September 1990 report or the Vancouver's Medical Health Officer's response to it.

The issue of turbidity was brought to the attention of GVRD residents by heavy rainfall throughout the month of November, 1990, and by particularly intense storms on November 11th and November 22nd to 24th. The intense rain caused flooding throughout the watersheds. As the floodwater made its way down to valley-bottom it scoured creekbeds, roads and exposed sediments along the shores of both the Capilano and Seymour reservoirs. In addition, the storms resulted in 30 landslides within the three watersheds which contributed to the introduction of turbidity--far in excess of the federal guidelines--into the District's water supply. The federal drinking water guidelines set the maximum acceptable concentration of turbidity at 1 NTU, or, if it can be shown that water quality is not being compromised, at 5 NTUs. As a result of the November 22-24 storm, turbidity levels from the Seymour reservoir exceeded 40 NTUs; water from the Capilano exceeded 30 NTUs; and water from the Coquitlam (which has historically provided the GVWD's cleanest water) briefly reached a peak of 19 NTUs: the result for residents of Vancouver was, literally, brown tap water (GVWD, 1991; Thurber, 1991).

The heavy rainfall and rising temperatures during the November 22-24 storm caused accumulated snow in the watersheds to melt, creating a rain on
snow event. GVWD estimated that the combination of rain and melted snow produced, during a 48 hour period at the height of the storm, 44 billion gallons of water, the equivalent of one-half of the annual water consumption for Greater Vancouver (GVWD, 1991). Of the 30 landslides triggered by the storm, one occurred within a cutblock in the Jamieson Creek drainage, the site of Golding’s hydrology research project since 1971, and nine occurred on the west side of the Coquitlam Lake, on the slope Wareing criticized GVWD for their road construction in his first report on the watersheds in October of 1988. According to the GVWD’s report on the storms:

It remains difficult to determine the absolute cause of the turbid water events other than to say that they are always associated with heavy storms and are more likely to occur after a significant period of moderate to heavy rainfall, that is, when the ground is saturated with water. Whether or not activities in the watershed are contributing factors is less clear. For example, the failure in the Jamieson Creek drainage is the first recorded significant failure of a cut block and there are 253 cut blocks in the District’s watersheds. (GVWD, 1991, p. 5).

The report did not mention the impact of road failures from either the November storms or any previous storms on the watersheds’ 270 km of roads, which research in other watersheds has shown to cause the single greatest source of sedimentation. The report also did not mention the relationship between clearcutting and rain on snow events. As for the significance of the Jamieson Creek slide, it went far beyond the fact that it was the first cutblock failure. The GVWD had been using the result of research conducted at Jamieson Creek as proof that their management activities were having no impact on water quality. Golding and his researchers had for 20 years monitored the effect of forest management on streamflow, sediment and the chemical characteristics of the water. His study concluded that there was no increase in sedimentation of the
stream after logging. As his study was concerned with surface erosion, it was not designed to evaluate the type of mass wasting event which occurred.

The response to the turbid water was immediate. GVRD offices received hundreds of phone calls from concerned residents, and on November 28, 1990, GVRD politicians responded by announcing a major study looking at the question of whether logging in the watersheds was affecting the region's water supply. The announcement was politically expedient, as the study was initiated by GVWD staff in March of 1989. During this period Wareing again attempted to gain access to the watersheds to document the damage from the storm, and once again his request was rejected by the GVWD's Morse on the grounds that he had not proposed a legitimate scientific research project. (Vancouver Sun, December 3, 1990, p. A12). Undeterred by the refusal to grant access to the watershed lands, WCWC chartered a helicopter on December 6th to fly over the affected areas. On December 7, 1990, WCWC issued a press release saying that the slide in Jamieson Creek, which started in a clearcut in Golding's research area, proceeded across a logging road and through a forested area to the creek itself, "may prove to be the final blow to any arguments for continuing clearcut logging." The release again called for a moratorium on logging and for a public inquiry into watershed management practices (WCWC press release, December 7, 1990). GVWD's response to WCWC claims was to say that the group "jumped to a conclusion that is not supported by available data" (Vancouver Sun, December 8, 1990). Morse then announced that a study by independent soil experts (Thurber, 1991) would be conducted to determine what caused the slides. Also on December 7th, the Vancouver Sun ran its first Op/Ed piece on the watershed debate, framing the issue as a personal feud between Wareing and Morse. After detailing each of their arguments and supporting materials, Morse is quoted as dismissing the need for a public inquiry: "There is so much emotion stirred up about forest
issues--some of which is very self-serving--that for a public discussion to take place is futile" (Vancouver Sun, December 7, 1990, p. A13).

Pressure continued to mount. The following week, in a letter addressed to Vancouver Mayor Gordon Campbell, Hedy Fry, President of the BCMA, clearly and forcefully expressed the degree of their concern over water quality:

"We urge you to take all possible steps, on an urgent basis, to cause the Greater Vancouver Regional district to institute a comprehensive, independent and adequately-funded inquiry and review of all matters relating to water quality in the Greater Vancouver Water District. (BCMA December 13, 1990. Correspondence between Fry and Campbell).

In January of 1991, WCWC published 30,000 copies of a four page tabloid "educational report" titled "Halt Watershed Logging." The report featured stories on the evidence linking dirty tap water to clearcut logging; the illegality of logging in the watersheds; the landslide at Jamieson Creek; and excerpts from research detailing the impact of logging in other watersheds. On January 14th, the GVWD released their Draft Summary Report on Watershed Management and Policy Review. The report was formally received by the Water Committee on January 22nd, which then passed a motion directing GVRD staff to "prepare a report regarding a public process workshop to review watershed management practices" (GVWD Water Committee Agenda February 12, 1991. Minutes from January 22, 1991 meeting, p. 3).

4.4 INCREASING DEMAND FOR PUBLIC PARTICIPATION

As the history of the three watersheds serving the Greater Vancouver Regional District has shown, the watersheds have been a source of controversy since shortly after the area was settled by colonists in 1862. The principle issues--land ownership, adequacy of the water supply, impact of logging on both the
quantity and quality of water, and the cost of delivering potable water to the residents of the region—have remained essentially the same for over 100 years. The first documented example of public input into the various debates over the watersheds dates back to June 4th of 1887 when the Council of the nascent City of Vancouver presented to the electorate a by-law to allocate funds for the financing of the city's first water system from the Coquitlam watershed. There were competing proposals from two private companies, one to supply water from the Coquitlam watershed, the other to supply water from the Capilano. The City Council's support of the Coquitlam proposal was tainted with accusations of partisanship, and rejected at the polls. The final count was 58 votes in favour, 86 against. (Vancouver News-Advertiser, June 5, 1887).

Since this first—and, from the vantage of the 1990’s, quaint—example of participatory democracy in watershed issues, the nature of the public's involvement has changed dramatically. As of 1994, the population of the Greater Vancouver area is approximately 1.6 million. In response to the complexity of our society and the issues facing it, a representative democracy has evolved where elected officials have been entrusted to make decisions on our behalf. The justification for this style of government is that the public is said to have neither the time, interest or expertise to make informed decisions. While this is thought to be a fundamental truth of contemporary politics, it is, however, a perspective being challenged by a growing demand for a return to some form of participatory democracy. The last two decades of citizen activism have confronted elected officials with new controversial points of view, and demands for input on numerous issues ranging from urban planning to environmental management. In response to this, participation processes have been developed as an integral part of management practices, reintegrating the public's voice in
decision making on specific issues which go beyond the four or five year cycle of selecting political representatives.

Following this trend, in January of 1991, the political response to the growing watershed controversy was to initiate a process to elicit broader input on a GVWD commissioned review of their management program. The public process consisted of the release of a draft report written by a panel of consultants, followed by two days of public meetings. A total of 109 written submissions were received by the watershed management review panel and 43 presentations were made by individuals and representatives of various stakeholder groups at the public meetings. This input was selectively incorporated into a final document outlining a revised management philosophy. The final document did not, however, address a number of significant points raised by critics of the management program, and as a result further aggravated the debate. This section briefly looks at the theory of public participation, and then details the GVRD public participation process.

4.4.1 public participation theory

The public participation theory referred to in this section is limited to the literature of resource management. It does not touch on public participation as it relates to public sphere theory. Public participation processes have flourished in British Columbia over the past decade. These processes have taken a number of forms ranging from multi-stakeholder working groups to advisory councils, and from formal inquiries such as Royal Commissions to public meetings, such as the ones held by the GVWD. Corresponding to the variety of forms are a variety of definitions which range from the general--any action taken by an individual or group to influence a decision; to the specific--equal participation in the making of the decision itself. The rationale for public participation is as varied as
the definitions. In a background paper written for the Forest Resources Commission, one of the more ambitious public participation processes conducted on the issue of forestry in British Columbia, Brenneis (1990) divides the rationale for public participation processes into three major categories: functional, democratic and political. Functional rationale for public participation is defined by practical aspects of the process such as facilitating more effective decisions through both government and public input and scrutiny of the issues; creating a more educated public as a result of this scrutiny; making use of public information and expertise; and ensuring more efficient decisions by reducing conflict if the process is perceived to be fair. Democratic rationale for public participation deals with the more abstract concepts of ethics, morals, fairness and equity, which are based on the characteristics of participatory democracy. The political rationale for public participation is that public participation processes can be used to enhance a government's image, to increase its credibility and to legitimate decisions. As Brenneis says of this third rationale, "The government gains legitimacy and protects their monopoly on decision-making power while at the same time they 'diffuse political responsibility' " (Brenneis, 1990, p. 9).

The rationale used to initiate any given public participation process is often reflected in the structure of the process. Arnstein (1969) developed a "ladder of public participation," a model which shows levels of participation ranging from true public participation, where citizens either have control of the process or are partners in the decision making, to non-participation, where citizens are merely being manipulated or placated. In between these two extremes is a category identified as "degrees, of tokenism", where the participants in the process are consulted or informed, but have little, if any, influence on the decision making itself.
The literature on public participation identifies a number of procedural elements necessary for an effective process. These elements range from the need for the structure of the process to be clearly defined and understandable, to the need for appeal mechanisms as a check against discretionary decision-making. Brenneis (1990) identified the following ten components in his review:

1. understandable process
2. democratic accountability
3. proper and adequate notification
4. legal mandate
5. comprehensive opportunities
6. access to information
7. adequate resources for participation
8. written responses
9. conflict resolution mechanisms
10. appeal mechanisms

While most of these are self-explanatory, the fifth component, comprehensive opportunities, deals with the important concept of public involvement in setting policy and the issues to be discussed as part of the process. Policy issues are rarely open for discussion in public participation processes. Arguments are often presented by government agencies that the issues underlying policy are too complex for public involvement. This argument is particularly prevalent in environmental issues where scientific and technical issues are claimed to be central to the decision making. However, as discussed in chapter two, as science is an interpretive framework based on a set of assumptions which may not be commonly held, the facts derived from scientific investigations often differ. This is a critically important point, with significant implications. As a 1991 review of consensus processes in British Columbia found:

Many people believe that if the technically "right" answer can be found, disputes can be resolved. There are many examples, however, of
disagreement over facts between qualified experts. In many of these situations, the focus tends to shift to the credibility of the experts and the legitimacy of the science they are performing. The issue becomes "whose facts", and the tactic is to discredit the opposition. Too often, the real disagreement is over the appropriate questions to be asked, and therefore, agreement on the answers is impossible. The result is that those least qualified to make expert determinations (for example, administrators, adjudicators, judges, or politicians) are forced to choose between sets of facts. (British Columbia Round Table on the Environment and the Economy, 1991, p. 7-8)

Even with a common definition of technical issues, conflict has the potential to occur over differences in the social values by which those issues are evaluated. The importance of addressing social values within public participation processes has been recognized within the public participation literature for a number of years. It has, however, proved to be difficult to incorporate the theoretical understanding into practice. To acknowledge the validity of different values, and to incorporate a meaningful discussion of these values into a public participation process, is a threat to the authority experts and elected officials presently enjoy. Consequently, bureaucracies have a tendency to resist the implementation of true public participation processes (Paehlke and Torgeson, 1990; Amy, 1990).

4.4.2 the gvwd process

In February of 1991, the GVWD drafted plans for their public involvement process. After noting "the management issues are primarily technical in content and can be complex, and views on sensitive environmental matters often become polarized and emotional," the proposal went on to define a process where the public would be invited to comment on a draft Watershed Management Evaluation and Policy Review (GVWD Water Committee Minutes, Item 2 (A) 4, Feb. 12, 1991, p. 1). Two days of public meetings were
scheduled and advertised in community newspapers throughout the district. Through these advertisements concerned individuals and groups (to be referred to as intervenors) were invited to make presentations (interventions) five to ten minute in length, or submit written briefs. A panel of Water Committee Directors was assisted by a panel of technical experts to respond to the submissions, and to ask any questions necessary to ensure that the presenter's position was clear. After the submissions were received, suggestions and recommendations obtained from them were incorporated into a final report as necessary. In the GVWD's opinion, "It is felt that this proposed public review process will ensure that ample opportunity is given for all interested individuals and organizations to provide input and direction to the future Watershed Management Program in a structured and professional manner" (GVWD Feb. 21, 1991).

The public review was held at Robson Square Media Centre from May 2-3, 1991. The interventions were all directed at responding to the Watershed Management Evaluation and Policy Review document, which was written by a panel of technical experts hired to review the existing management program, identify existing impediments to better management and make recommendations for change. The panel concluded that the existing management program was meeting the terms set for it by the Amending Indenture, but recommended that changes be made. They found that logging on a sustained yield basis was not in the best interest of maintaining water quality and recommended that the Amending Indenture be renegotiated to remove this condition. They also found that the system of financing watershed management activities from logging profits led to an undesirable conflict and recommended that the watershed management program be funded from a separate source. They proposed that the management philosophy be updated to reflect advances
in watershed management, and that a detailed ecological inventory be conducted to use as a starting point for the updated management practices.

While the panel made these recommendations for change, the panel's report supported the basic assumptions guiding the watershed management program since it was initiated. The panel recommended that the watershed forests continue to be proactively managed (logged) to mitigate risks from fire, pest infestations and disease, but under a new risk management framework, as opposed to a sustained yield regime. Based on their review of studies conducted in the GVRD watersheds, the panel found that logging and road building activities did not appear to be affecting water quality (Economic and Engineering Services, 1991, p. ES6). They recommended that "timber harvesting and road building be specifically targeted to towards high risk and impact areas such as fuel management" (Economic and Engineering Services, 1991, p. 1), with the goal of "enhancing the watershed's resistance to insects, disease, fire and erosion" (Economic and Engineering Services, 1991, p. ES9).

4.4.3 overview of public input

During the public participation process, support for the management program came with the full weight of the industry complex. Submissions and presentations were made by representatives of forest companies, the Ministry of Forests, the A.B.C.R.P.F., professors from U.B.C.'s Faculty of Forestry, the Council of Forest Industries, the I.W.A., and numerous grassroots organizations representing the interests of individuals dependent on the forest industry. Their support focused on the following points:

-the forests are at risk from devastation by pest infestation, disease and subsequent fire.
natural erosion exists regardless of any human activities therefore road building is essential to access natural slides as they occur and to conduct preventative measures

- a "hands-off" approach invites a catastrophic event in the watersheds

- intervention is necessary to maintain water quality in the long term

- the panel found no evidence showing that logging and road building in the watersheds threatens water quality

- the review panel is both independent and qualified, and their recommendations should be followed

- the risk from logging is less than the risk from not logging

- heavy rainstorms will trigger turbidity no matter what management activities occur in the watersheds, it is therefore unfounded to say that logging caused the November 1990 turbidity

- a decision to halt logging in the watersheds would have repercussions throughout the province as small communities look at the decision as a precedent to follow.

- a decision to halt logging would cause an unacceptable loss of jobs in the GVRD area

- a decision to halt logging would result in an increased water rate for residents of the GVRD

While the environmental community was well represented at the public hearings, criticism of the report came from a wide range of sources including: an associate professor from faculty of forestry; a professional engineer; a fisheries biologist; the municipality of North Vancouver; and an adjunct professor of Geography at U.B.C. Their criticism focused on the data, methodology and conclusions of the report:

DATA
- a lack of data supporting conclusions made in the report.
Data presented within the report does not accurately reflect the source of watershed fires, or the extent of land affected by fires from escaped slash burns. Exhibit ES-2 in the Economic and Services, 1991 (p. ES3) shows that the damage from fire from 1900 to the present totaled 900 hectares. This apparently does not include the 1925 fire in the Capilano valley which led directly to the creation of the GVWD. In this fire alone, an estimated 1,300 hectares of land was burned.

The claim there is no evidence linking erosion with road construction and logging within the watersheds is false given that the GVWD's own data shows a rate of slide activity within cutblocks in ATCS 3 to be consistently two to three times higher than in unlogged areas, and cutblocks in ATCS 2 within the Seymour watersheds, slide occurrence was twice as frequent.

Conclusions reached within the report are contradicted by data presented within the report's appendix. (specifically in regard to the above).

Data presented within the report does not distinguish between number of slides, and the more important measurement of the volume of materials released by the slides.

Data presented within the report does not clearly represent the extent of the area logged within the watersheds.

The report contained comparisons made between the number of slides in roaded and logged areas vs. the number of slides in unlogged areas which concluded that fewer slides occurred in the logged areas. This was criticized as being misleading because only a small percentage of the loggable land-base has been cut so far. (In response to this criticism, in March of 1993, almost two years after the publication of the original document, revised charts were distributed by the GVWD which showed a greater occurrence of slides in ATCS 3 cut areas, than in uncut areas.)

METHODOLOGY
Turbidity monitoring at intakes only does not provide information on sedimentation from various management activities on a sub-drainage level, nor does it provide information on the rate of sedimentation of the reservoirs themselves.

Golding's study area not representative of the watersheds and therefore research findings are not validly extrapolated.

The ATCS uses an unusually wide range of slope steepness (from 0-27 degrees) within the first classification. Also, the ATCS filter does not identify small slopes which are steeper than the general classification in which they are located.
The fire model used to assess fire hazard within the watersheds is outdated and inaccurate.

CONCLUSIONS
- The claim that the watershed forests are subject to catastrophic fires is not supported by evidence.
- The claim that old growth forests are more susceptible to fire than second growth forests is false, research shows that old growth forests are less susceptible than second growth forests.
- The rationale that pests are a major threat to the watershed forests fails to recognize that infestations are cyclical and only affect certain species within a given area, not the whole area as claimed by the GVWD.
- The assumption that the old growth forests are in decline is false.

4.4.4 analysis

According to the theory, the functional purpose of a public participation process is to elicit input which will improve the quality of decisions made. The criticism directed at the management program raised significant points about both the validity of assumptions guiding the report, and about the methodology used to justify those conclusions. This input was made by knowledgeable individuals with experience in related areas, and deserved serious consideration. Yet the changes made to the final report were primarily cosmetic and involved the elimination of contentious language (such as the use of decadent and overmature to describe old growth forests) and the clarification of "misinterpreted" issues. According to the panel, the participation process showed that the "public" had a limited understanding of watershed issues and recommended an "active public relations program" to address the problem (Economic and Engineering Services, 1991, p. 6). This is a revealing conclusion suggesting that because the intervenors did not see watershed management issues in the same light as the panel did, the intervenors, as opposed to the panel,
needed to realign their perspective. In other words, the panel, having decided the proper way to manage watersheds, was not open to the input the process was designed to hear. An analysis of the structure of the process further supports this claim.

The structure of GVWD's public process presented a number of obstacles for those opposing the existing watershed management program. First of all, there was no public input into defining the terms of reference for the public review process. By limiting discussion to comments on the GVWD management evaluation document, it excluded topics relevant to the issue that have been excluded from the "official" definition of the problem--specifically, the assumptions underlying the GVWD's watershed management program. On the first page of the Final Summary Report (Economic and Engineering Services, 1991) the authors state that all watershed management activities should be "based on the principles of watershed resource protection", yet no acknowledgment is given to the possibility that these principles, as the critics of the watershed management program argue, are in need of revision.

Secondly, the structure of the review process was criticized by both public advocacy groups and politicians for favouring the position advocated by the GVWD. According to Lenore Herb of the Society Promoting Environmental Conservation (SPEC), "I'm not happy with this one-sided review where consultants are chosen by the GVRD. I think they should allow the public to decide" (Tri-City News, March 10, 1991). Vancouver Alderman Bruce York believes that "the whole process is too internalized. It's almost set up to justify what has already taken place" (The West Ender, February 28, 1991). The British Columbia Medical Association and the Western Canada Wilderness Committee criticized the presence of Dr. Golding from the University of British Columbia's Faculty of Forestry and Dr. Carr from Terrasol Consultants as individuals on the
panel with a conflict of interest in the management review. In Golding's case, he has received $10,000 per year from the revenue derived from logging in the watersheds to conduct hydrological research in the Capilano watershed since 1970. His research is being used by the GVWD as evidence that no detrimental impact from logging is occurring in the watersheds. Dr. Carr's presence on the panel was questioned because his company has received work from the GVWD to hydroseed road cutbanks in the watersheds. Because of this, WCWC and BCMA called for the creation of a panel independent of any connections with the GVWD to be formed to review the watershed management program. The Panel's response was to refer to itself as a "special" as opposed to "independent" panel in the final report.

Third, the GVWD was not bound to incorporate the substance of the input into their management plans—authority for decision making remained with the GVWD staff and their consultants. While the review panel acknowledged each written submission with a written response, the incorporation of public input into the final document was limited. Regarding criticism of technical issues, the final report either further explained why they interpreted data the way they did—which did not address the criticism of their interpretation, as in the case of turbidity monitoring, or reframed the issues to emphasize a different aspect, such as fuel management. Other changes made in response to the criticisms amounted to little more than the rewording of the text, and the reworking of some tables. The one substantive change in procedure based on public input was the incorporation of a new stability index to guide management activities. None of the substantive criticisms regarding the validity of conclusions reached, or the appropriateness of the underlying assumptions were addressed by anything more than by statements of disagreement or reference to the practices of other jurisdictions such as Seattle and Portland (which are both embroiled in a
controversy similar to the one in Vancouver where the assumptions and
evidence guiding their management philosophy are being challenged). Some of
the statements of disagreement are most curious, particularly a response to
Michael Feller, associate professor at U.B.C.'s Faculty of Forestry, and an
experienced researcher on the effects of logging on streamwater quality and forest
fire science and management. In a critical review of the draft document he
concluded that "neither the rationale for timber harvesting nor the assertion that
timber harvesting does not adversely affect water quality, can be supported
scientifically" (Economic and Engineering Services, Public Input Document, 1991,
Submission #57 p. 2). After detailing the reasons for this conclusion he stated
that "timber harvesting should only be permitted where it has no adverse impact
on water quality. This is what should determine the level of timber harvesting"
(p. 6). The Review Panel's response was to express their disagreement with the
statement, saying that their risk management framework should drive all
logging decisions.

Feller also criticized the panel's finding that an old growth forest is more
susceptible to fire than a managed forest. According to Feller:

The net affect of forest management in the watersheds is to increase the
fuel hazard, increase the risk of fire caused by people, and increase the
area which can sustain faster spreading fires and more severe crown fires,
compared to the existing old-growth forest situation (Economic and

The panel's response to this criticism was to state that:

The Panel feels that all management activities in the watersheds must be
based on a risk management framework. However, we must also realize
that some short term risks may be necessary in light of the overall goal of
reduced long term risk to forest stability, and thus water quality. If timber
harvesting operations are causing unacceptable short term risks while
not achieving any significant reduction of the long term risks, we see no
reason to continue such operations (Economic and Engineering Services, Public Input Document, 1991, response to submission #57, p. 3).

Feller's criticism of the conclusion that logging did not appear to be affecting water quality was met with the response that "it does not appear that current harvesting and road building practices have been a significant causative factor of excess turbidity at the water intakes" (p. 4). While accurate based on the results of research which Feller criticized for not being able to either prove or disprove that logging was responsible for the production of sediments, the response did not acknowledge the very likely possibility that research designed to monitor sub-drainages would show the correlation.

Criticism of the report's conclusion that logging and road building was necessary for the long-term health of the water supply was made by a professor of biological sciences at Simon Fraser University, Dr. Bruce Brandhorst. According to Brandhorst, the conclusions of the report form:

...a radical proposal, presented in quasi-scientific terms, which is unsupported by the experimental and observational data presented in the Draft Report. Moreover, it contradicts a large body of published scientific literature which concludes that undisturbed coastal rain forest is most resistant to fire, insects and disease, and maintains the highest quality of water when undisturbed by man. The failure of the Panel in preparing its Draft Report to acknowledge that literature and present its rationale for repudiating it is inexcusable; this omission demonstrates an unacceptable level of ignorance and ineptitude in preparing a "scientific" document, if not outright bias (Economic and Engineering Services, Public Input Document, 1991, submission #99, pp. 1-2).

On the same theme, Otto Langer, a professional biologist and expert court witness on sedimentation of streams wrote that:

The vast majority of scientific literature indicates that the building of roads and the logging of a watershed results in altered flow patterns and
is almost always accompanied by more debris and sediment input into the stream. To conclude that old growth forests generate more dirty water than an area subject to road building and logging is a case of wishful thinking so as to support some hidden agenda (Economic and Engineering Services, Public Input Document, 1991, submission #93, p. 2).

This criticism of the watershed management program focussed on the panel's failure to adhere to fundamental criteria of scientific investigation: conclusions were drawn from inadequate evidence; methodology used to evaluate risks to the watersheds was outdated or inadequate; and a large volume of relevant literature linking erosion to logging and road building was disregarded.

Fourth, there was no appeal mechanism established to which dissatisfied participants could turn. The Panel's final report was not open to further discussion through any mechanism which could evaluate complaints made about it. The only recourse available was political lobbying, a technique used by numerous parties to the debate, and which placed politicians in the position of having to evaluate conflicting interpretations of the issues.

While the public participation process was clearly dysfunctional, it was not without value. Most importantly, the process provided the opportunity for new sources of analysis and criticism to be heard. Secondly, it provided the opportunity for the elected officials of the Water Committee to hear comments on watershed management from individuals other than the GVWD staff—who, until that point, had been their almost exclusive source of information. These are significant points, for prior to the public hearings there was an absence of mechanisms through which criticism of the watershed management activities could be channeled. As this study has shown, between the years 1960 and 1988, there was no public account of opposition to the watershed management program. When the criticism began in 1988, it was primarily from an individual associated with an environmental group. Despite Wareing's professional
credentials, his association with an advocacy group accused of having a "preservationist's" agenda was used to discredit his motives. Through the public process, the official GVWD position was challenged by other professionals with relevant expertise, adding further weight to concern about the existing management regime. Given the nature of the criticism they were subjected to, it would seem reasonable to expect that the GVWD management would be forced to publicly defend their practices. During the period following the public meetings and the release of the Final Report Summary Report in September of 1991, the key criticisms of the management program, as detailed above, received little public discussion. As the following chapter will show, in the newspapers reviewed for this study, the only mention of the criticism directed at the management review by these other scientists was made by a columnist. No mention was made in any news story. It is possible that with limited exposure to the criticism, public concern over the issue did not rise, which in turn allowed the GVWD to simply dismiss or ignore the substantive criticism. Consequently, the rationale for the existing management regime was not effectively challenged and continues to guide the GVWD.

4.5 VALUES

The following section contrasts the environmentalist and technocratic values systems which are part of the watershed management debate. Critics of the watershed management program have been accused of being driven by an ideological agenda by GVWD staff and other proponents of their forest management practices. According to a registered professional forester who at one point in the debate represented the Association of B.C. Professional Foresters: "The watershed battle has been reduced to an ideological argument between those with ecocentric views and those who believe that man is not an
inherently destructive forces but one that can actually do some good in these types of situations" (Rob Kyle. Letter to the editor of the Georgia Straight. July 1, 1994). While acknowledging that values do play an important point in the debate, this section argues that to dismiss criticism of the GVWD's watershed management practices simply on the grounds of ideological differences fails to account for the weight of the scientific information excluded from management decisions.

An understanding of the differences in the basic beliefs and values--the ideology--of those supporting and those opposing the management program is as important to understanding the dynamics of the watershed debate as is the historical context in which it developed. Ideological perspectives towards environmental issues have been characterized as falling into two distinct structured views of the world, or paradigms (Cotgrove, 1982; Milbrath, 1984). While simplifying the range of thinking each paradigm brings to environmental issues, it does prove to be a useful model nonetheless. Using this characterization the GVWD's position can be generalized as fitting within the technocratic paradigm, which has fundamental beliefs including: 1) man's mastery over nature; 2) scientific rationality's objective analysis separating facts and values; 3) determination by experts; and 4) the benefits of accepting risk. At the opposite end of the political spectrum is the environmentalist or humanist paradigm which, conversely, believes in: 1) harmony with nature; 2) limits to science due to distrust in its "presumption of value-free 'facts' " (Miller, 1985, p. 22); 3) consultative and participative decision making; and 4) careful avoidance of risk.

As these differences imply, environmentalists and technocrats have radically different concepts of how society should be structured. In terms of forestry, technocrats believe that: 1) we need to control nature in order to
improve on it for human benefit; 2) the science of forestry has sufficient knowledge to achieve this objective; 3) the scientists with this knowledge should be responsible for making decisions regarding the management of our forests; and 4) given the scientific certainty over forestry practices, the risks from our present course of action are minimal and totally acceptable. Environmentalists believe: 1) nature has intrinsic worth and we should minimize our disturbance of the forests, mimicking as opposed to dominating nature; 2) the science of forestry cannot possibly understand the processes occurring in a forest given the complexity of ecosystems and the limited time span in which the science has based its observations; 3) decisions on forest management should not be left to scientists, given their lack of knowledge, and should be made with as much public participation as possible; and 4) the risks of wholesale tampering with natural systems are not acceptable. It is important to recognize that these differing perceptions are based on ideologically filtered perspectives of the same world. Technocrats and environmentalists are looking at the same forests but are seeing something radically different based on their beliefs and values. As Miller says, "What is of interest here is the extent to which ideology, and not 'facts', influences our judgment on environmental matters" (1985, p. 21).

It is also important to recognize that both paradigms have self-contained, coherent ideological systems justifying their world view as the essential path to follow for the benefit of all. According to Cotgrove: "The paradigms of environmentalists and technocrats are more than sets of beliefs about how the world works: they are also strongly held views that one kind of world not only works better but is better than another" (1982, p. 46). Technocrats believe that only through proper management of the natural world--which is defined as the utilization of resources for human benefit--will we be able to continue to improve, or at the very least maintain, our present standard of living;
environmentalists believe that our utilization of the world's resources cannot be sustained at its present level and will ultimately result in a drastically lowered standard of living, if not the outright extinction of our species. From their own perspective each paradigm is trying to achieve what it sincerely believes is in the interests of humanity, but, with their differing definitions of the problem, their means toward this common end are considerably different.

The heart of the debate between paradigms comes from the enormity of this schism separating the two ideological camps. With such divergent beliefs, the resultant mutual misunderstanding and mistrust makes communication problematic:

It is because protagonists to the debate approach issues from different cultural contexts, which generate different and conflicting implicit meanings, that there is mutual exasperation and charges and counter charges of irrationality and unreason. What is sensible from one point of view is nonsense from another. It is the implicit, self-evident, taken for granted character of paradigms which clogs the channels of communication (Cotgrove, 1982, p. 88).

This paradigmatic rift presents particular problems in terms of risk communication. Cotgrove (1982) and Milbrath (1984) found consistently different tolerances for risk among those prescribing to the technocratic and environmentalist paradigms. In essence, technocrats are prone to accept risk related to technology, environmentalists are not. Miller (1985) synthesized a range of literature on the psychological and socio-political roots of environmental ideology in an attempt to cast some light on the difficulties of risk communication between paradigms. He found that:

1) Not only do the different paradigms have different attitudes towards risk, they have different attitudes about what constitutes risk. Industrialists, with
their faith in science, perceive less risk from human activity—whether it be the practice of clearcut forestry or the development of nuclear technology—than do environmentalists. This lower perception of risk is based on their confidence that scientific rationality provides the necessary information on which to act, and that any associated risk is acceptable in light of the benefits. Conversely, environmentalists, with their belief that scientific certainty is far more elusive than technocrats admit, are less tolerant of risks associated with industrial development.

2) The issue of differing risk perception is further complicated by differing criteria each paradigm prefers to employ to assess whether or not environmental damage has occurred. Technocrats believe that unless there is clear scientific proof that links their activities to environmental problems, there is a no problem. Environmentalists reject this notion of burden of proof believing that such proof often does not exist at the time the decisions are being made.

3) Following the differences in perception of risk and the different criteria by which each paradigm prefers to access risk, there are also disagreements about how decisions on risk should be made. The technocrats prefer "'hard-headed' rationality with decisions being made on the basis of technical-factual information by experts exercising their technical judgment," whereas the environmentalists prefer to include a wider range of considerations incorporating "socio-political-ethical matters," and allowing for "genuine public participation in the decision process" (Miller, 1985, p. 23).

The way the environmentalist/industrialist debate is evolving in our society is in the form of a power struggle with each perspective trying to establish their vision of the world as definitive. With increasing public concern for environmental issues leading to the election of political representatives predisposed to the environmentalist's perspective, our society appears to
moving towards a shift away from the industrial paradigm. However, with the dominant position the technocratic paradigm has held in the development of our society to date, our physical, political and legal infrastructure embodies the values of industrialism to such an extent that those very values appear to be invisible because of their pervasiveness. Thus the support of the status quo is defended as a neutral position, while support of the environmentalist's paradigm, being a challenge to the existing structures of authority, is viewed as a fundamentally biased perspective.

4.6 CONCLUSIONS

This chapter has shown how the debate over watershed management evolved since the turn of the century. Concern over the impact of logging was voiced as far back as 1902. At that time logging companies had the support of the provincial government as both were seeking to profit from the liquidation of the watershed forests. A prolonged debate ensued with arguments between levels of government and the forest industry. Following a catastrophic fire attribute to logging in the summer of 1925, the provincial government reluctantly agreed to both create the GVWD, and to lease the watershed lands to the city for 999 years. With the new management in place, all logging was stopped. From 1926 to 1952, the management culture within the GVWD was firmly opposed to logging. Following the death of GVWD's founding commissioner, skillful promotion of the new science of watershed management gradually convinced senior staff to embrace the sustained yield theory. During this key policy transition period, information was carefully managed as to not provoke a region accustomed to a hands-off approach to watershed management. It was a successful job of public relations, with almost no critical voices appearing for over thirty years.
In 1969, one critic of the forest industry's control of watershed management was pushing for the application of better science. Unfortunately, Professor Walter Jeffrey, was killed in an accident before his cautious watershed management philosophy could spread to the GVWD. Another twenty years was to pass before a new criticism of watershed management reappeared. By the late 1980's, it took, at a time of societal concern for environmental degradation, the voice of a "renegade" professional forester to get forestry science issues back at the table. In the face of rising concern, the GVRD initiated a public participation process to diffuse the concern. Through tight control of a process which failed to allow discussion of the assumptions guiding their management philosophy, the GVWD controlled the questioning of their science. Significant criticisms were simply ignored, or dismissed as being ideologically driven. As the next chapter will show, the media coverage of the public participation process closely followed the GVWD's position: the criticisms of the science were simply ignored.
CHAPTER V.
THE ROLE OF NEWS MEDIA

5.1 INTRODUCTION

The standard definition of "newsworthy" is at odds with the nature of processes central to environmental degradation. News media react to specific events and typically ignore process. Thus the grounding of the Exxon Valdez oil tanker results in extensive coverage, while cumulative impact of oil leaking from private automobiles on an annual basis--an amount far greater than what was released by the tanker--remains unreported. Similarly, a nuclear accident such as occurred at Chernobyl and Three Mile Island generates extensive news coverage, while the consequences of routine nuclear waste disposal remains a low priority news story. As this study will show, for the issue of watershed management, a sudden increase of turbidity in the water system precipitates coverage, while the activities which likely contribute to that turbidity are ignored, unless some catastrophic event can be shown to clearly connect the two. With the absence of such an event, the issue of what causes turbidity is the subject of debate, which then, according to the definition of news, becomes more newsworthy than the management issues themselves.

Numerous studies have shown that journalists rely on institutional sources, a reliance which frames issues in the terms provided by those sources. The official sources are newsworthy through their status as being representative of the public or organization they serve. Their critics become newsworthy through the conflict they generate with those official sources. Thus the media version of the debate over watershed management becomes the conflict between parties, instead of an examination of the veracity of claims.
Due to limited budgets, reporters typically cover a wide range of issues and rarely have the luxury of the time necessary for in-depth research. Consequently, they have little more than their professional judgment with which to evaluate claims on technical issues. In order to meet tight deadlines, they rely on readily available information, which typically comes from official sources—organizations with a budget for delivering information quickly and reliably. Conversely, environmental groups rarely have either the financial resources or staff with which to provide a similar service—which further increases reliance on the official sources.

To provide the "balance" necessary for coverage of watershed management issues, reporters, pressed for time, have relied on individuals readily identifiable as being "the opposition", rather than searching out new sources. As a result, the statements of the GVWD have been contrasted predominantly with the statements of the WCWC, to the exclusion of the other critics, such as Feller, Langer, and the BCMA.

The result of these institutional norms is a news product which tends to perpetuate positions advocated by official sources--government and corporate. Given the influence media has in our society, this has profound implications. Research into the effects of news media coverage supports the conclusion that what is presented in the news, and the way it is presented, influences the way individuals within our society think about, and in some cases act in relation to, the issues reported (Singer and Endreny, 1993). This is of political significance in a democratic society for government and corporate management of resources must have the tacit approval of the electorate.

Marchak's (1983) analysis of the forest industry found that public opposition to resource policies causing degradation of the physical environment, depletion of the timber supply and "increasing peripheralization of the
economy" (p. 2) was minimal. She suggests two explanations for this lack of public concern. The first is that since the industry supplied jobs, wealth and a high standard of living, the short term benefits have been so high as to obscure the long term implications of forest policy. The second explanation is that the public simply lacked sufficient information on which to base judgements. Noting the importance of the media's potential role in informing British Columbian's about both the state of the forests and the implications of the policy and legislation guiding their management, she offered the following hypothesis:

In the major cities of the lower mainland, many citizens have minimal contact with forests. Though forestry has been the dominant industry throughout this century, and though Royal Commisions have published reports, the mass media have not created a climate of debate by informed citizens. (Marchack, 1983, p. 31, emphasis added).

In her analysis of the introduction of a controversial new Forest Act in 1978, she found that media coverage of the debate was "sparse":

Most evident by its absence was a detailed examination of the bill itself. There was no context for readers to assess the validity of the opposition attacks or the government's defense. Nor did the press seek out news and interviews beyond those given to it by various interst groups. ...During the crucial month when the legislation was open for public debate, newspapers provided almost no examination of such facets of the bill as stumpage rates, licence provisions, contractor clauses, reforestation problems, or the place within industry of the interest groups which were making the statements. With respect to the legislative debates, a superficial representation of speeches was provided. ...generally only that part which appeared "startling" and could easily be stated was printed (p. 66).

That this legislation was passed, she comments, "...one is ill-advised to attribute government action the legitimation of 'majority' support when support takes the form of apathy" (p. 31).
Given the central role news media have in defining our social reality, particularly for issues outside of our personal experience, this study argues that the media discourse on watershed management issues is a politically important source of information on the subject. Critical information on the consequences of GVWD watershed management activities has the potential to rouse the electorate, which in turn has the potential to create political pressure for changes in policy. Following a review of the theory of how media report on environmental issues, this chapter looks at the Vancouver Sun and The Province's coverage of watershed management issues, paying particular attention to coverage of the 1991 public participation process.

5.2 NEWS MEDIA AND ENVIRONMENTAL ISSUES

News coverage of environmental issues follows a well documented cycle of attention and inattention. In terms of the amount of space in commercial news media dedicated to environmental issues, environmental degradation was a relatively insignificant news story prior to 1969 (Rubin and Sachs, 1973). O'Meara's content analysis of the New York Times revealed 119 column inches devoted to environmental issues in 1962, compared to 1259 column inches in 1970 (as quoted in Schoenfeld et al, 1979, 46). Parlour and Schatzow (1978) analyzed media coverage of environmental issues in Canada from 1960 to 1972 and found a dramatic increase starting in 1968, peaking in 1970 and falling off dramatically by 1972 when coverage of the energy crisis redirected media attention. Schoenfeld (1983) found that evidence of the rise in popularity of environmental issues from the mid-1960s to the mid-1970s can clearly be seen in the explosive growth of specialty and general interest magazines dealing with environmental content. He concludes that "no clearer example of the symbiotic relationship of social currents and the magazine enterprise in America may exist.
today" (470). McGeachy's (1988-1989) research would seem to concur with this after finding that over a 25 year period from 1961 to 1986 magazine coverage of environmental issues coincided with the rise and decline of popularity experienced by the environmental movement. The apparent correlation between the increase in public concern for the environment and the increase in media coverage raises the question of the news media's role in the formation of concern about the environment.

The relationship between news coverage and public salience of issues has been widely studied using the theory of "agenda setting". Since McCombs and Shaw's (1972) seminal study, researchers have sought to empirically connect the content of news coverage with the public's perceived salience of issues. The basic concept of the theory is that only after the news media report an issue, and thereby define it as important, does the audience perceive the issue as worthy of their attention. The agenda setting model postulates that audience interest is a reflection of media coverage. Despite somewhat contradictory results in the volumes of academic papers produced on the subject (see McCombs, 1981; Roberts and Bachen, 1981 for a comprehensive overview of the literature), agenda setting is widely regarded as a powerful force in the formation of our society by framing not so much what people think, but what people think about. Furthermore, Zucker's (1978) research on agenda setting found that the theory was more likely to describe the effect of news coverage of events outside of personal experience, where media provide the only frame of reference.

In keeping with the theory of agenda setting, Parlour and Schatzow (1978) found no evidence of widespread public concern about environmental issues prior to the dramatic increase in media coverage, concluding that the media "acted as major catalysts in generating and sustaining public concern for environmental issues" (13). However, they noted that: 1) media coverage
during this period was largely guided by the initiative of individual reporters who subjectively chose which stories were in the public interest; 2) the "bottom-up" setting of the media's environmental agenda, without a managerial response, resulted in a lack of adequate resources in terms of the scientific and technical expertise essential for original investigative reporting; and 3) this lack of investigative reporting "suggests that the media have reacted to, rather than initiated, concern for environmental problems" (12). The contradiction between saying that the media generated and sustained public interest, and at the same time reacted to rather than initiated this interest, highlights one of the weaknesses of the agenda setting model: it does not account for the formation of the media's agenda.

Responding to the incomplete descriptive abilities of the agenda-setting model, Parlour and Schatzow propose to replace the agenda setting "public-mass media interaction model" with a more complex "elite-mass media-public interaction model" which incorporates the influence of elites, special interest groups and trigger events into the creation of media agendas (1978, pp. 14-5). A further refinement of the model is urged by Kline to: a) incorporate the interactions of other organizations with the press; b) account for "the interpretive dimensions of news coverage"; and c) integrate a more sophisticated notion of public opinion (1984, pp. 51-2). The concept of external influences on the creation of news agendas is central to the literature examining the relationship between media and social movements.

Research on the relationship between social movements and the news media indicates that media are not the initiators of social innovation. In fact, through structural constraints to be discussed shortly, news media tend to guard against changes interpreted as a threat to the status quo. Environmental stories, as Lowe and Morrison (1984) argue, are "a non-success story for human
achievement which, by implication, offers a critique of the ethos and logic of advanced industrialism" (78). Given the nature of this critique, news media, as members of that industrial order, were understandably slow to pick up on concern for the environment that was already widely discussed in other social channels (Schoenfeld et al, 1979, p. 49). Schoenfeld et al's conclusion that the media act as "more thermometer than barometer" would appear to support the conclusions of Olien et al's (1989) analysis of the relationship between media coverage and social movements. They found that:

1) Media serve not as watchdogs for a general public, but primarily guard dogs for powerful interests and mainstream values.

2) Media play accelerating rather than initiating roles in social movements.

3) In addition to accelerating roles, media play decelerating or "cooling out" roles.

4) While media coverage of issues tends to reinforce established authority, the flow of information does increase in intense periods, as expected by social-conflict theory. (160).

While these four steps highlight the process through which media effect control over social movements, a different analytical tact reveals institutional structures of news organizations and their influence on environmental organizations which serve to perpetuate the existing order:

...On balance, the newsmaking process acts as a moderating influence on movements. It may produce a temporary escalation in rhetoric or activity but it penalizes these by balancing them with more conservative elements of legitimated sources. Newsmaking also puts a premium on organizational characteristics typically found in the relatively conservative groups of a movement. The pressure toward moderation exerted by the media, then, derives not so much from the personal ideology of reporters, as often suggested, but principally from impersonal organizational forces and professional norms (Kielbowicz and Scherer, 1986, p. 90-91).
Gitlin (1980) argues that these organizational forces create a "fundamental, inescapable dilemma" for social movements as they either risk being marginalized by media if they fail to moderate their position, or if they do, they risk being "assimilated into the dominant hegemonic order" (p. 291).

While commercial media have been shown to favour the perspective of mainstream society, dissenting opinions are found within the discourse of news media. Gitlin concludes that the media do not form an impenetrable system perpetuating hegemonic order, rather they are a partially contested arena in which meaning is successfully negotiated. Reaching a similar conclusion, Hackett (1991) identifies spaces where dissent can be, and is, expressed: "Through contradictions within the dominant ideology and official discourse, the structural needs of news organizations, and an independent streak in journalistic culture, the political and media systems themselves generate openings for dissent and change" (p. 277). In their quest for larger audiences, media are reporting environmental degradation to an extent which, by the sheer volume of coverage, according to Olien et al's fourth concluding point, succeeds in putting critical perspectives onto the public's agenda.

5.2.1 nature as news

Reporting environmental issues is inevitably a difficult task given the complexity of the planet's ecosystem and our society's limited understanding of the consequences of manipulating its various components. Calling environmental reporting the "Journalism of Uncertainty," Tichenor (1979) identifies the beat's difficulties as being: a) the environmental information itself; b) the extent of expert disagreement; c) the tentative nature of scientific evidence; and d) uncertainty over how to report these uncertainties. Friedman (1983), elaborating on Tichenor, identifies the main problems of the environment news
beat as: a degree of complexity which takes more time to unravel than deadlines allow; the difficulty of accessing and understanding the highly technical information associated with environmental issues—which includes the problem of identifying expert sources giving biased information for political reasons; and constraints imposed by the structural characteristics of mass media.

5.2.2 the commercial nature of news

There are a number of structural constraints within news organizations that guide the coverage of environmental stories. The first of these is that news media are a business and consequently direct their operations with concern for their financial well-being. This is manifest in a number of ways. To start with, news media are vehicles for advertisers to reach potential customers. The larger and more affluent the audience, the more revenue the news media are able to collect for their advertising space. In order to maximize profit, news media try attract the desired readership by presenting information that matches their interests. There is a direct correlation to be made between the rise in coverage of environmental issues and the demographic profile of the percentage of the population expressing interest in the subject. Starting in 1987 there has been both an increase in concern for the state of the environment and in the number of stories appearing in print. A Gallup survey conducted in the United States in 1989 revealed that "39 percent of Americans strongly identify themselves as environmentalists," which not only forms the country's largest single market, but also represents a remarkably affluent group (Russell, 1989, p. 2). Not having to worry about the basic needs of food and shelter, the affluent are able to expend time and energy on environmental concerns. With the demographic characteristics of this market, news media are addressing their environmental concerns in an attempt to increase advertising revenue. Hackett (1991) argues
that the consequence of this quest for market share perpetuates reproduction of dominant views:

Audiences cannot be enticed and entertained if they are being upset by media content that consistently challenges prevailing preconceptions and cultural stereotypes. Instead, it can be argued, commercial media need to render media content compatible with, or at least noncontradictory to, the advertising messages they carry. Accordingly, news audiences are subtly addressed or positioned as consumers of commodities and spectators of politics (p. 274).

In keeping with the theme of audience as consumer, Anderson (1991) believes that green consumerism will continue to be central to the coverage of environmental issues as news media report on environmental issues in a way which engages their audience in readily available solutions to problems. Given commercial media's economic imperative to expand, or at the very least maintain, their audience, it should follow that the nature of their environmental coverage does not represent a fundamental critique of the dominant beliefs in our society. According to Lowe and Morrison:

...social criticism enters the content of environmental news through the gradual elaboration of alternative views of the achievement of industrialism. However although a critique of technological progress is implicit in many environmental events, the reporting of such events can either point up this oppositional message or mask it, through the encoding of news in terms which emphasise scientific remedies, technological fixes of simply the extraordinary (and therefore the apparently exceptional) character of environmental accidents. Much will depend on the outlook of journalists and the organisational and editorial constraints upon them (p79).

5.2.3 limited budgets

A general trend occurring within news organizations is the reduction of operating budget and the consequent reduction of staff. Media organizations with limited budgets rely on news that is readily available, which can mean: a)
providing limited budgets and tight deadlines for investigative reporting, which increases dependency on official (government or corporate) sources for environmental stories (see Sachsman, 1976); b) imposing a wide range of beats to be covered by individual reporters, thus limiting the time necessary to develop expertise in any given area; and c) using stories from the national wire services instead of having a reporter assigned to an environmental beat, resulting in a greater emphasis being placed on national as opposed to local problems, which in turn can lead to a sense of complacency on the part of public and regulators for the problems are regularly portrayed as being elsewhere (Friedman, 1983, p. 26).

5.2.4 Self-censorship

Dependent on advertising revenues, news media are reluctant run stories that have the potential to conflict with the interests of their advertisers. Information on the health consequences of smoking has been suppressed in news magazines supported by the tobacco industry's advertising dollars (Weis and Burke, 1987; Warner et al, 1992). Pressure not to run critical stories can come from both outside of and within the media. Sellers and Jones (1973) found that controversial stories were either killed or reworked at three levels within the news media: by top management; by middle management second-guessing top management; and by reporters engaged in a process of self-editing stories that might be too controversial. The result of this censorship, whether externally or internally rooted, is a working environment that discourages investigative journalism and promotes a sanitized vision of corporate activities.

5.2.5 Corporate ownership

Fourth, media ownership has the potential to influence editorial content in the same way advertising revenue does. Lee and Solomon (1991) argue that
NBC's coverage of environmental issues overlooked the activities of General Electric, a corporation with one of the worst environmental records in the United States--and the owner of the RCA, which in turn owns the NBC network:

GE's ownership of NBC underscores a dilemma inherent in mainstream media: The same corporations that own and sponsor mass media in the U.S. are among this country's most prodigious polluters. With mass media dominated by big money interests, it's not surprising that a pro-business slant pervades most reporting. Through selective emphasis and omission, news on the environment is typically skewed in ways that favour the multinational giants who spend big bucks to advertise their wares or peddle a benevolent image crafted by public relations specialists (p40).

A particularly blatant example of media ownership affecting coverage of environmental issues occurred when Alaska's largest oil-field services company, Veco International, bought the state's second-largest daily newspaper in December of 1989. After extensive negative media coverage following the Exxon Valdez oil spill (March 24, 1989), Veco's owner was reported to have said he bought the paper to ensure the oil industry's viewpoint was represented in the media (Lee and Solomon 1990).

5.2.6 journalistic conventions

Another form of the structural constraint imposed on news media comes from the basic conventions of journalism. As Lee and Solomon (1991), Hertsgaard (1990), Friedman (1983) and Sellers and Jones (1973) all detail, the hard news peg, objectivity, short deadlines, response rather than initiative reporting, and reliance on official sources individually and collectively impede the reportage of environmental issues. Of these, perhaps the convention of objectivity is the greatest single barrier. Objectivity, providing an unbiased account of the world, presupposes that the world can be witnessed by reporters without the influence of either personal experience or organizational routines--
which are themselves the product of the ideological basis of the society in which they function. Reporters are asked to provide an impartial account of environmental issues using the criteria of a society whose premises are based on resource exploitation. Thus environmental issues are reported on by referring to economic impacts as a standard measure, and by evaluating environmental issues in terms of financial costs opposing certain benefits—which are invariably defined in anthropocentric terms, yet to frame the issues in a broader context invites the accusation of biased reporting because it contradicts the basic premises of our society.

Because of the media's norms of balance and fairness, reporters are likely to seek out, and quote divergent opinions. The net result of this process may be a spurious image of equally valid opposing positions, an image that serves to confuse, rather than enlighten, the unsophisticated reader. In addition, the presentation of divergent opinions, if there is no "weighting" by either the relative frequency with which they are held or the quality of the evidence on which they are based, may confer an inaccurate, even biased, picture of knowledge in the field (Singer and Endreny, 1993, p. 15).

5.2.7 organizational factors

An additional structural constraint related to the organization of news media is the complex nature of environmental stories which made it difficult for news media to establish a structure from which these stories are to be reported. Prior to 1969 when the New York Times hired the first full-time environmental reporter, there was no defined environmental beat in commercial news media. Editors, not knowing what to make of the wide range of subjects falling into the environmental category, left a great deal of freedom to individual reporters to define the beat according to their interests, which had its advantages—no editorial constraints, and disadvantages—inadequate editorial support (Parlour and Schutzow, 1978, p. 12). Since that time, the environmental beat has become
established (and as previously detailed, constrained) to varying degrees, in mainstream media across North America (see Russell, 1988). But as Hertsgaard (1990) argues, the establishment of the environmental beat has its own detrimental effect as environmental issues become compartmentalized and isolated from other issues such as business, politics, science, and education--which fails to recognize the horizontal integration central to all environmental issues. In British Columbia's largest daily newspaper, the Vancouver Sun, environmental stories are covered by a separate editorial department, thus the institutional structure of the newspaper, which places forestry in the business section, becomes an obstacle to reporting the environmental aspect of the industry's practices.

5.2.8 media influence

While the news media's institutional inertia has a tendency to perpetuate existing beliefs, individual readings based on personal experience ensure a variety of interpretations from any given text. These multiple readings result in unexpected and uncontrollable consequences of media coverage. Hungerford and Lemert (1973), Althoff et al (1973), and Murch (1971) have shown that there is tendency for print media to focus on environmental problems occurring outside of a particular newspaper's own distribution area. The reasons for this include the reluctance of individuals to acknowledge problems in their own communities (Murch, 1971), and an editorial philosophy that wishes to minimize the possibility of offending local social and political elites (Hungerford and Lemert, 1973). Hungerford and Lemert call this "environmental Afghanistanism", which, they conclude, "...may be helping national news media to create and maintain an agenda upon which somebody else's environmental
problems always are more important, and more serious than your own" (1973, p. 508).

This approach may, however, have consequences over the long term that ultimately achieve precisely what it set out to avoid—that is, increased awareness of and concern over local problems. Lowe and Morrison (1984) suggest that the coverage of environmental problems "elsewhere" may combine with personal experience of localized environmental degradation, resulting in the transformation of "many discrete problems into a major public issue" (p76). It is likely this is the process that took place as public interest in environmental issues rose exponentially after the media discovered the environmental degradation "story" in 1969.

In British Columbia, media treatment of deforestation in Brazil during the late 1980's provides a recent example of issues in other regions affecting attitudes towards local conditions. Concern over the global implications of rainforest destruction following extensive media coverage of the problem led to increasing levels of concern over local deforestation, so much so that one of the stated objectives of the Council of Forest Industry's public relations campaign for 1990 was to develop an "improved ability of upper income and educated groups to distinguish between global environmental issues and ones involving the B.C. forest industry" (Decima, 1990). In a speech made by a Vice President of the industry organization, this communication objective is further explained: "Our research indicates that these groups also tend not to distinguish between global environmental issues such as the ozone layer and the disappearing Amazon forest, and local issues such as clearcut logging and wilderness preservation in British Columbia" (Sinclair, 1990). The industry believes that these groups' mediated knowledge of Brazilian deforestation is greater than knowledge of the local industry's practices. Whether that be the case or not, this example provides
an indication of the unintended consequences of "environmental Afghanistanism." It also raises the question of the impact of mediated experience.

Wiebe (1973) argues that the mediated vision of the world presented to us in news is fundamentally different from our own personal experience, and that the character and quantity of the information delivered, while radically expanding our view of the world, overwhelms our intellectual capacity to respond, leaving us "befuddled by a quasi-reality that affects but cannot be effected" (p. 429). The condition resulting from this is a state of "well-informed futility" that immobilizes individual initiative. In regard to environmental issues, the exponential increase in news coverage, according to Wiebe's theory, is simultaneously creating a level of higher awareness and concern, while decreasing the individual's perception of his or her ability to do anything about the problems. As he says, "We strive for the status associated with being well informed only to feel the anguish of making no difference" (p. 429).

Elaborating on Wiebe's theory, Novic and Sandman (1974) suggest that the sense of futility over personal actions engenders a belief system which looks to government and industry to solve the problems--a belief system which decreases notions of personal responsibility. Kline's (1984) study found that "futility and problem off-loading seem to be the major reactions to the intense media coverage of the energy crisis" (p. 42). But clearly, this reaction to the volume of environmental coverage is not universal, so what factors contribute to the exceptions?

The existence of a core group of environmental activists suggests that either Wiebe's argument cannot be generalized across the population or that another factor is involved. Sellers and Jones (1973) found that environmental activists (as defined by those belonging to environmental organizations) do not
consider the dramatic increase in media coverage of environmental issues to be important, because they do not consider the news to be a significant information source. Their research indicates that environmental groups, not mass media, are the primary information source for activists, followed by the category "other", containing technical books and journals, professionals and specialists (p. 54).

That environmental activists do not rely on mass media for information about environmental issues, and that the politically inert do, suggests the influence of mass media's distribution of news may not be the empowering democratic institution it is purported to be. It may, in fact, be just the opposite as it creates a climate conducive to non-participation. Wiebe sees, this as a structural problem within our society as the technologies of information distribution have outpaced "social arrangements for channeling the energies of informed citizens back into social action" (p. 426). On a more critical note, Chomsky claims that the structure of the commercial mass media "is designed to induce conformity to established doctrine" simply because it is impossible in the time and space allotted to individual stories to present challenging concepts with the evidence necessary to give them credibility; "regurgitation of welcome pieties faces no such problem" (1989, p. 10). Further to Chomsky's point, Gitlin (1980) believes that the structure of news, with its problem/resolution tidy story construction, promotes social stability by conveying that whatever is wrong in the world can be put straight by the official action to address it (p. 267), which further supports both Novic and Sandman (1974) and Kline's (1984) assertions that news coverage of environmental issues contributes to an off-loading of personal responsibility.
5.2.9 news sources

Seminal research into the sources relied upon by journalists has shown that the primary definers of key issues reported on tend to be from the dominant institutions in our society: government, the courts and industry. As journalists strive to maintain objective accounts of the various issues they report on, they inevitably turn to these established authorities. Hall et al (1978) found that media's use of "objective" statements from these "accredited sources" results in "definitions of social reality" fundamentally aligned with the official perspective (p. 58).

In news coverage of environmental issues, content analysis has clearly shown that official sources--government, industry, scientists--are cited significantly more often than environmental groups (Gandy, 1980; Greenburg et al, 1989; Hansen, 1991; Einsiedel and Coughlan, 1993). Under certain circumstances, however, it is possible for environmental groups to influence the agenda of an issue by acting quickly enough so as to define it before any of the traditional primary definers. Anderson (1993) has shown how Greenpeace had success with this strategy during their seal campaign conducted in England throughout the latter half of 1988:

...Greenpeace obtained a considerable amount of press coverage since official sources, such as the Department of the Environment and scientists linked to government did not act swiftly enough to "define" the problem. As responders to issues raised on scientific and political agendas, on occasions, non-official sources are treated as principal definers of the debate (pp. 64-5).

In the majority of situations where environmental groups are the primary definers, it is through staged protests and direct action--a forum, as Hansen (1991) points out, which carries considerably less 'legitimacy' in Western democracies,
than the forum of 'formal political activity/parliament' or the forum of 'science' " (p. 450). Hansen, however, argues that the low profile of environmental groups relative to official sources does not reveal the complexity of their influence:

The low profile of pressure groups as primary definers in actual media coverage indicates that, while they may play a key role as claims-makers, drawing the attention of the media to particular environmental problems, it is to the fora of "public authorities", "formal politics" and "science" that journalists turn for validation of such claims. Consequently, both continued media coverage and the wider elaboration of certain environmental problems hinge crucially on the extent to which they become part of, and articulated through, the agendas of these and other established "fora" (Hansen, 1991, p. 451).

That Hall et al's concept of primary definers cannot account for the indirect influence of unofficial sources is not the only criticism directed at the theory by recent research into media-source relations. Anderson (1993) argues that the "primary definer" theory is too static to account for changing social conditions which allow for different groups to access the media at different times. She points out that during the late 1980s the surge in interest in environmental issues saw environmental groups such as Greenpeace and Friends of the Earth attracting considerable media attention, attention which has since waned as other issues, such as the recession, have taken over the media agenda. Linne's (1993) research on media treatment of Greenpeace in a comparative study of Danish and British television news, found that the primary definer theory is not sensitive to either historical changes or cultural differences.

Schlesinger (1990) criticizes Hall et al's reliance on the structuralist model, which, in his words, is:

profoundly incurious about the processes whereby sources engage in ideological conflict prior to or contemporaneous with the appearance of
definitions in the media. It therefore rules out asking questions about how contestation over definitions takes place within institutions and organizations reported by the media as well as the concrete strategies pursued as they contend for space" (emphasis in original, p. 68).

This recent research advocates the need for more holistic approaches to researching the role of media in the social construction of environmental issues. Hansen (1991), while acknowledging the contribution of traditional approaches to media analysis, cautions against the limitations of their descriptive ability:

Agenda setting studies, diffusion studies, public opinion and media influence research, and studies of media organizations, of the professional values of media operatives, of source-communicator relationships in news production have contributed in various ways to our understanding of 'mass media and environmental issues'. But because of their media-centredness they are not, on the whole, capable of explaining why media (and to a lesser extent, public) concern about environmental issues fades in and out of focus, or why certain issues come to enjoy prominence while other, equally 'serious', issues fall by the wayside.

Is to a larger constructivist framework, and the conceptualization of the media therein, that we must turn to for a more holistic view of media roles in the construction of social problems. Because of the focus on 'social problems' rather than 'media', such a framework enables a recognition of the interactive and the parallel, rather than the unilinear, processes which characterize the emergence and growth of environmental issues as issues for public concern and political action. It also facilitates an understanding of media coverage of environmental issues which goes beyond the (ahistorical) focus on the immediate actors involved (scientists, politicians, pressure group activists, journalists) to consider how the wider 'cultural givens' and 'cultural resonances' help privilege the advancement of some issues and not others. (Hansen, 1991 pp. 453-4)

The objective of the following section of this study is to examine the news coverage of watershed management in relation to its political, social and economic context. By tracing the development of each of these elements in the preceding chapters, and by analyzing the news coverage using the media theory
just reviewed, I detail how commercial media are structurally biased against challenges to the status quo. As a result of this bias, a number of significant, cogent arguments challenging the GVWD watershed management philosophy are marginalized in the news coverage.

5.3 MEDIA COVERAGE OF WATERSHED MANAGEMENT

5.3.1 methodology

The news coverage examined for this analysis was restricted to Vancouver's largest daily newspapers, the *Vancouver Sun* and *The Province*. Historic news coverage pertaining to GVWD watershed management issues was identified by using the British Columbia Provincial Archives News Index, which covers from 1900 to the present. The index's relevant subject headings are: from 1900 to 1980, "Vancouver--water supply"; from 1981 to the present, "Water supply--Greater Vancouver"; and from 1952 to the present, "Greater Vancouver District Water Board." As this study is primarily concerned with the news coverage of the recent watershed management debate, no attempt was made to review all the historic news coverage. During the early years of the century I pulled selective stories based on title content. The objective was simply to get an idea of the types of arguments appearing in the newspapers at that time. During the period between 1952 and 1988 there were so few stories on watershed management that I pulled the majority of them, again based on title content. Concerned the lack of stories may have been due to their location in a different subject heading, I contacted the British Columbia Legislative Library staff, who, upon checking their indexing system, confirmed the results of my research.

Contemporary news coverage from 1988 to 1992 was collected through daily monitoring of the target newspapers. To ensure that no stories were missed, I cross-referenced my clipping files to the GVWD and WCWC clipping
files, adding any stories that I missed in my own monitoring. For a final check, I used the Canadian News Index to verify that my sampling was complete. As a result of these measures, I am confident that few, if any, stories during the study period were missed. With the collection in place, I established a database containing the basic classifications of newspaper, author, date, page, and genre. In addition, I created categories for sources mentioned by name and issues discussed. The final category I referred to as "trigger event," which was used to classify, where I could determine it, the action which initiated the news coverage. Examples of these actions include: GVWD meetings; the tabling of official reports; WCWC news releases; natural events such as flooding; and protests.

In addition to the basic quantitative analysis of who was saying what, and when and where it was being reported, I also applied subjective analysis. This took the form of comparing news coverage to the events as the history of the watershed debate revealed. In doing this I was looking as much for what was not covered as what was covered. To evaluate the critical or non-critical nature of the reporting, I used a measure of the number and nature of sources. At the non-critical end of the scale were stories with one source, one perspective. At the critical end of the scale were stories with a number of different sources and opposing perspectives.

5.3.2 1887-1925

At the turn of the century a lively debate developed over the issue of logging in the Greater Vancouver Regional District’s watersheds. The provincial government was aligned with the forest companies because of the income they derived from issuing timber leases within the watersheds. The municipal government was opposed to the logging because of the threat it presented to the city's water supply. This debate, pitting municipal against provincial
government, resulted in extensive news coverage and heated political controversy over watershed management policies. During the years 1905 and 1906, when the provincial government was issuing a new round of timber leases and the Mayor of Vancouver was calling for the purchase of the Capilano Valley, the controversy between the municipal government and provincial government was reported on extensively. According to the British Columbia Legislative News Index, there were almost 100 stories on watershed management issues in 1906 alone, of which 48 appeared on the front page. In 1924, when the debate was again heated over the provincial government's plans to continue issuing timber leases in the watersheds, over 100 stories appeared in print, of which 41 were on the front page. These stories reported on--at length--a wide range of opinions from academics, provincial health agencies, and both municipal and provincial politicians.

5.3.3 1926-1952

With the creation of the GVWD in 1926, and the adoption of an official policy of no logging in the watersheds, media coverage during this period focused on the process of stopping the logging that was taking place, the costs associated with the purchase of all privately owned lands within the watershed boundaries, and the improvement of the water delivery infrastructure. Construction of a dam on the Capilano river, chlorination of the region's water and the increasing costs of delivering water were the most significant issues of the period.

5.3.4 1953-1988

During this period the GVWD adopted a forest management philosophy which justified logging the watershed forests because of a perceived threat to their stability. Starting in 1952 and continuing through to 1988 I was able to find
no news coverage critical of the significant policy change in watershed management.

Koop's (1993) research shows that information management was an important part of the GVWD's strategy to implement their new management philosophy. In November of 1953, three news stories written by a reporter at the Daily Province newspaper discussing the change in GVWD management philosophy were suppressed by the consultants responsible for the report recommending logging in the watersheds. A letter written to Commissioner Berry on November 10, 1953 by the C.D. Schultz and Company documents that:

...we are pleased to advise that the Daily Province has seen fit to cancel the proposed story by one of their reporters, Mr. Leiterman. Their decision was no doubt based on the fact that you as Commissioner... and Dr. George S. Allen as Dean of the Faculty of Forestry at UBC were each misquoted, and the figures used in the three articles were far from factual or applicable" (as quoted in Koop, 1993, p. 33).

According to the unpublished articles, which Koop found copies of in the GVWD files at the Vancouver City Archives, Leiterman quoted Berry as being extremely critical of the "logging fraternity" whom he judged for the devastation they caused in the Capilano watershed:

"we're in the water supply business-not the logging business." He flatly rejected the forester's thesis that it would be feasible (and profitable) to be in both.

If there are experts who claim modern timber cropping can be carried on without cutting off the water, Mr. Berry says he can get just as many experts to argue the other way. Access roads, he maintains, concentrate the run-off--upset the balance of nature--stir up sediment in colloidal suspension so the water is so dirty it can't even be filtered clean.

He is not too concerned at the danger of a bad fire wiping out the watershed for lack of a road to get in and fight it. "We have been operating 27 years, and our losses have been negligible. No recent fire has been over three acres. Our protection is so good that when other people get in trouble they call on us.... Our experience is, the more roads
there are the more people want to go in, and frequently these people
don't take too much care."

But, says Commissioner Berry, there are 600,000 people getting their
water off those slopes and some day there may be 1,250,000. It would be a
"great pity to take chances. Some day," he concluded, "the people will
thank those of us who today may be considered fanatical in our desire to
protect the watershed"
(as quoted in Koop, 1993, p. 35).

These sentiments were in keeping with the writings of Berry at that time. In a
report dated February 15, 1954, Berry detailed the Water District's opposition to
any road construction in the watershed. Among his concerns: an increase in
sedimentation from cut and fills associated with the construction of a road; the
persistence the turbidity once introduced to a reservoir; an increased danger of
fire associated with human presence in the watersheds; and the likelihood that
road access would "encourage logging operators to seek cutting rights in the
upper part of the valley...a programme that should perhaps not be undertaken
for years, if ever" (Berry, 1954, p. 27).

Leiterman was an experienced, award winning journalist (Koop, 1993, p.
33). Even with the unlikely possibility that his stories contained significant
inaccuracies, that an outside agency could exert such influence over the media is
remarkable. It is also remarkable that the same agency could exert such an
influence over Berry, for, by 1956, he had accepted the notion of logging and road
construction in the name of watershed management.

During this important transition period in watershed management, I was
unable to find any opposition voiced in the news coverage. The few stories that
were written on the topic of GVWD watershed management focused on the
construction of the Capilano dam, opposition to the construction of a public
highway through the Capilano watershed, and opposition to opening the
watersheds up for recreational use. There was no mention of the C.D. Schultz
report, which was tabled in December of 1956. The first mention of watershed logging was on May 30, 1960, when it was reported that the sale of timber was helping to finance the clearing of the Seymour valley for the new reservoir (Vancouver Sun, May 30, 1960, p. 19). Almost two years later, on April 16, 1962, the next mention of logging was to report on the $100,000 profit made from salvaging trees in the Seymour valley which were said to be infected with balsam woolly aphids (Vancouver Sun, April 16, 1962, p. 10). The profit generated by the sale of the infested wood was reported as being an incidental benefit. No mention was made of a significant policy decision to begin to construct roads further into the Seymour watershed. A year later profit from the ongoing salvage operation was reported to exceed $184,000 (Province, March 11, 1963, p. 15). No mention was made of the GVWD's February 9, 1963 application to the provincial government to initiate a sustained yield approach to watershed management--the approach recommended by the Schultz report five years earlier. The next story appeared three years later and focused on the risk the woolly aphids were posing to the watersheds. According to the account, loggers were at work in an "exclusive, private preserve", which while closed to the public, was open to pest infestation (Vancouver Sun, May 14, 1966, p. 63). The story went on to describe that while the infestation affects only Balsam trees the remaining trees were also logged to prevent the risk of them being blown over, resulting in an even greater fire hazard. The profit from the salvage operation in 1965 was reported to be $260,000. Again, no mention was made of the application for a change to a management philosophy centered on logging.

In mid-February, 1967, both the Sun and The Province newspapers reported that a new agreement between the Greater Vancouver Water District and the provincial government would allow sustained yield logging to take place in the watersheds (The Province, February 15, 1967, p. 25; Vancouver Sun,
February 16, 1967, p. 3). According to the Water Commissioner, Frank Bunnell, the GVWD had earned about $260,000 a year for the past six years from the salvage operation. He said that under the new agreement the amount logged would only be slightly increased. The Province newspaper quoted retired Commissioner Berry as voicing support for implementation of the watershed management strategy which was initiated during his term at the GVWD: "At one time...the board opposed this policy, but conditions change. If the shed is not logged it will be nothing but a forest of dead trees" (The Province, February 15, 1967, p. 25). The Province also reported on the policy change in an editorial which mused about the possibility of opening up the watersheds for recreational use (The Province, February 20, 1967, p. 4).

For the next twenty years, all sources for all the news reports I reviewed were associated with the GVWD management. The coverage reported on logging as a necessity which had the incidental benefit of being profitable. No critical opinions appeared in any of the coverage, and no critical letters to the editor were published in response to any of the stories, including one which featured a front page photograph of a clearcut in the Capilano watershed (Vancouver Sun, December 13, 1969, p. 1). Curious as to why the lack of critical news coverage, I contacted the editor of the Province newspaper for the years 1965 to 1972. His recollection of the issue was that it was happening in an era when British Columbia was the logging industry. The public simply didn't care about what the GVWD was doing, consequently the news coverage reflected that level of interest. He also offered the thought that the presence of a strong advocate for an issue tends to generate media interest, which, he said, helps to explain why coverage of the watershed management reflected the GVWD management's position (Interview with Paddy Sherman, November 10, 1994).
While the last decade of this period was marked by a significant rise in controversy over the impact of logging throughout the province, I was able to find no specific mention of the GVWD management as a source of controversy. This pattern of coverage persisted through two major storms which introduced turbidity into the water supply. On October 31, 1981 a major storm passed through the region triggering landslides and producing, for the first time on record, turbidity in all three watersheds (GVRD Administration Board Minutes, November 26, 1981). The same storm also washed out the highway joining Vancouver to Squamish, which in turn triggered yet another call to construct a highway through the Capilano valley. The GVWD maintained their opposition to the highway arguing once again that the region's water supply would be jeopardized by public access through the area. In the media coverage of both the turbidity event and the highway proposal, there is no record of any discussion of the impact of logging and road construction in the watersheds. In November of 1983 another major storm struck the area, producing turbidity in the water supply. Once again, there is no record of any discussion of the impact of logging and road construction in the watershed.

5.3.5 1988-1992

The WCWC issued a press release on October 25, 1988, claiming that logging in the Coquitlam watershed was placing the health of the region's residents at risk. With no specific event to link their claim to, the release went unreported. On December 15, 1988, WCWC issued another release claiming that "a major mud slide, negatively affecting the purity of what has often been called North America's cleanest drinking water, has just been discovered in the Capilano Watershed" (WCWC Press Release, December 15, 1988). In response to this more tangible claim, on December 17, 1988, the Vancouver Sun published
their first story containing claims that logging was affecting water quality since the late 1920's when logging was being phased out by the newly created GVWD. The story was titled "GVRD denies claim of Capilano mud slide," and proceeded to quote GVRD staff as saying "there is absolutely no evidence of any new slide activity at all" (Vancouver Sun, December 17, 1988, p. A14). The story juxtaposed Wareing's statement that "the mud slide is definitely the result of logging on a steep slope," with the GVRD's claim that "we started logging eight years after the slide."

This story was the first of 94 that appeared in the Vancouver Sun and the Province during the period of this study's analysis. It set the tone for much of the coverage in the years to come. First of all, it illustrates the need for dramatic events to generate news coverage of an issue that does not necessarily happen in a dramatic fashion. Second, with a lack of an easily identifiable relationship between management activities and the production of turbidity, Wareing's accusations are simply challenged by the GVWD management. The burden of proof is placed on Wareing to prove his claims, and not on the GVWD to prove theirs--a task made that much more difficult by GVWD's refusal to grant Wareing access to the watersheds. Third, as the theory shows, the selection of sources used for any given story directly influences the definition of the issue being discussed (Gans, 1982). Of all the sources quoted, Morse and Wareing were repeatedly made to be representative of the proponents and opponents of GVWD management. In the 94 stories examined, there was a total of 149 individuals and organizations referred to by name. Of this number 35 were GVWD/GVRD staff; 31 were GVRD politicians; 37 were experts, scientists or medical doctors; eight were industry or union; and 40 were environmental advocates. Wareing was quoted 23 times; Morse was quoted 23 times. This compares to 5 mentions the next most cited environmental advocate, Paul Hundal of SPEC.
The emphasis on Morse as the voice of the GVWD is simply due to his position in management. As one reporter explained, Morse's desk is where the buck stops (Interview with Harold Munro, October 19, 1994). The emphasis on Wareing as the voice of opposition can be explained in a number of ways. First of all, he was the only full-time environmentalist working on the issue. He had the expertise, and he initiated the debate. But other critics of the program came forward, particularly through the public participation process. Few of these critics were reported on. In fact, following the public participation process in 1991, only two of the new critics were quoted in news stories immediately following the public meetings. Ian Austin, a reporter from the Province, quoted Dr. Ian Gumeson of the BCMA as expressing his concern over the introduction of sediments to the water supply, but not assigning any blame to the GVWD management practices. Stephen Hume, a columnist from the Vancouver Sun wrote two columns detailing the Michael Feller's critiques of the management practices (Vancouver Sun, May 8, 1991, p. A3; and May 10, 1991, p. A15). Neither Feller or the arguments he brought to the debate were used in subsequent news coverage, until one year later when his presentation to the water committee was reported on. Feller, an associate professor at U.B.C.'s faculty of forestry and expert on fire effects, told the committee members that the management activities are actually increasing the risk of fire, and not decreasing it as their staff would have them believe (Vancouver Sun Feb. 10, 1992, p. B1). Considering the implications of his critique, which Stephen Hume had detailed a year earlier, that they were not followed up by other reporters writing on the issue is remarkable.

A second reason Wareing came to be characterized as the opposition was because his definitive statements regarding the slide in 1988 made him an easy target. Throughout the debate, proponents of logging focussed on Wareing as the
critic of GVWD watershed management activities, effectively directing media attention away from the other critics. In an opinion/editorial piece the debate over watershed management was characterized as a "chainsaw challenge" between Wareing and Morse (Vancouver Sun, December 7, 1990, p. A13).

According to Gitlin's (1980) analysis of the civil rights movement, media need a spokesperson to focus on, to frame their stories in readily comprehensible human terms. The net result is to obscure the systemic nature of the issues reported on by focusing on the individual. In the "chainsaw challenge," the reporter describes both men as being reasonable and basing their polarized opinions on substantial evidence. After detailing the history and extent of logging in the watersheds, he contrasts one claim against another:

Wareing says the forest in the watershed is young and healthy, ranging from 200 to 400 years old.... Morse's response, briefly, is: 'That's absolutely baloney....Fifty percent of the cedar we take out is punk in the middle....It's rotten. Many of the trees are totally punk, potentially blow-downs with exposed rootballs and serious soil erosion problems (Vancouver Sun, December 7, 1990, p. A13).

These claims are interesting because, with the information given, there is no way to evaluate one against the other. It becomes a mere difference of opinion as no attempt is made to explore the assumptions each has brought to their interpretation. This point, counter-point style of reporting is characteristic of the news coverage, with Wareing's claims refuted by Morse.

Analysis of the news coverage reveals that the majority of stories appearing in the news were initiated by the release of reports commissioned by the GVWD. Of the 94 stories, 50 were triggered by a GVWD event of one sort or another. These include water committee meetings and the release of GVWD reports (which accounted for 33 of the 50); the public participation process (8 of
the 50); and GVRD contacts with media (9 of 50). Stories directly attributable to WCWC statements and press releases total 11 of the 94. Three other environmental groups, and one environmental coalition initiated a total of 5 stories with their press releases or media contacts. Protests at the gates of the watershed triggered 5 stories. These oppositional voices combine for a total of 21 stories. When compared with the official triggering events, the initiative for defining watershed management issues clearly lies with the GVWD.
CHAPTER VI.
ANALYSIS

6.1 GVWD MANAGEMENT

At the turn of the century a lively debate developed over the issue of logging in the Greater Vancouver Regional District's watersheds. Initially the controversy was between water users and logging companies conducting commercial logging operations. The provincial government was aligned with the forest companies because of the income they derived from issuing timber leases within the watersheds. The municipal government was opposed to the logging because of the threat it presented to the city's water supply. This debate pitting municipal against provincial government resulted in extensive news coverage and heated political controversy over watershed management policies. After more than 25 years of arguing, the provincial government agreed to sign over the watershed lands in a 999 year lease. An agency, The Greater Vancouver Water District, was then created to manage the watershed lands. The agency's first action was to terminate all logging. This was a policy they maintained during the entire tenure of their first commissioner, E.A. Cleveland. Upon Cleveland's death in 1952, the GVWD management philosophy started back towards allowing logging to take place, only this time in the name of scientific management as opposed to profit. Technical expertise developed and promoted by the forest industry was used to justify why logging of watersheds was necessary for the long term maintenance of water quality. With the tabling of a 1956 report, forest industry experts had convinced GVWD management of the need to log the watersheds valuable old growth. To the industry experts the forests were decadent and their replacement with "thrifty young stands" was
effective management against the threat of catastrophic fire. It was a convincing argument, especially as the revenue derived from logging could be used to subsidize GVWD operations, in perpetuity, as the sustained yield theory postulated. However, the report which argued for the application of this approach in the GVRD watersheds acknowledged that no research had been conducted on the impact of logging on forest hydrology. Despite this crucial lack of data, the management regime was implemented in the mid 1960's.

The first step towards sustained yield management came in the form of an emergency program to log diseased timber, a program which proved to be more profitable than anticipated. The success of the salvage operation was limited only by the terms of the original lease, which restricted logging to areas owned outright by the GVRD, as the revenue from any logging on Crown land would have to be turned over to the Crown. In 1967 an Amending Indenture to the lease was signed which opened the watershed forests to a sustained yield management regime. The Amending Indenture enabled the logging profits to be used to fund the watershed management program. The Amending Indenture also ensured the provincial government received their share of the profits in the form of royalties. Thus the watershed management issue came full circle back to the 1920's, with the exception that under the new regime the municipal government was just as eager to profit from the logging--which could now, thanks to the industry expertise which defined the sustained yield theory, be justified in the name of maintaining water quality. With provincial government, municipal government, industry and academic expertise aligned, there was no debate over the management of the GVRD watersheds. According to these aligned interests, it was a success story, an example of human improvement of natural systems, and of the incidental benefit of financial profit.
And logging proceeded behind gates which were closed to the public in order to maintain water quality.

During the 1980's, rise in concern for environmental issues worldwide combined with personal experience of environmental degradation led to increasing challenges to forestry practices in B.C. Used to limited opposition, the industry was unprepared for the criticism it was subjected to. Protests resulted in negative press coverage. Rising concern resulted in political pressure, and land use decisions took forests away from industry. Confident about the validity of their forest management practices and concerned that their message wasn't getting through to British Columbian's, the industry initiated extensive public relations campaigns. In keeping with this approach, GVWD staff has long held the belief that a lack of public understanding of the issues is responsible for concern over watershed management activities. When the new management regime was introduced in the late 1950s, information was carefully managed to ensure minimal opposition. With the management regime established, logging took place out of public sight, out of public mind. When concern over forestry issues began to increase throughout the province, the GVWD, in cooperation with the forest industry, established the Seymour Demonstration Forest in 1987 to educate urban residents who had little if any contact with forest practices, yet were becoming a significant source of political opposition to the industry. When the GVWD watershed management was criticized starting in 1988, the GVWD and industry defended the management activities as being the best example of integrated resource management in the province. While GVWD's vocal critics were dismissed as being driven by an ideological agenda, the concerned public was perceived to simply lack an understanding of the basic watershed management issues. In response to this, GVWD initiated a public education
process emphasizing their new risk management approach to watershed management.

6.2 PUBLIC INVOLVEMENT

Opportunities for meaningful public input on watershed management issues have diminished since the early years of the century. The importance of a dependable source of water was appreciated by the first residents of Vancouver and issues regarding the supply and delivery of water were a regular part of public debate at the turn of the century. With a secure water system established by the GVWD, and as the region's population grew in size and complexity, direct public involvement in water issues decreased. The job was left to politicians to oversee and GVWD staff to manage. With the transformation of management philosophy in 1952, public input was further limited by the definition of watershed management as a primarily technical issue, to be guided by "professional men".

This persisted for over 30 years, until in the midst of renewed societal concern about environmental degradation, an individual, Mark Wareing, challenged the GVWD over its watershed management practices. A Registered Professional Forester whose employer had been the Ministry of Forests, Wareing was familiar with the GVWD management activities in the Coquitlam watershed. Critical of GVWD logging and road construction, he launched a campaign for one of the region's highest profile environmental groups, the Western Canada Wilderness Committee. At an early point in his efforts he attributed a landslide to clearcutting in the watersheds. What had actually occurred is that clearcutting took place in an area which had previously been the site of a landslide, which, over the course of subsequent years became progressively larger. Since his claim could be shown to be incorrect, proponents
of the management program repeatedly used this to discredit his criticisms of the watershed management program. By referring to Wareing as the opposition, and noting his lack of credibility, GVWD and its proponents were able to divert attention away from other critics, while at the same time they were able to cast aspersion on their critics as a whole.

As concern mounted, the GVRD initiated a public participation process to hear comments on a review they had commissioned of their management practices. This review provided the first formal opportunity for input into the watershed management activities. Critics of the management program wrote detailed and scathing submissions. These submissions challenged both the assumptions used to justify logging, the methodology used to gather evidence, the conclusions made in support of continued logging, and the omission of reference to volumes of published research showing a definite correlation between logging, road building and sedimentation. The criticism came from both environmentalists and scientists with relevant expertise. The result of the public review process was a continuation of the existing management program with only minor modifications. The substantive criticisms of the management program were dismissed. The dysfunctional process had no dispute resolution mechanism hence, despite its dismissal of significant criticism, could still be used to justify the management program. It continues to be referred to by proponents of the GVWD as being a thorough scientific review proving no adverse impacts from logging.

6.3 VALUES

Where values enter into the forestry debate in British Columbia is over the issue of whether or not the short term economic benefit of liquidating the old growth forests is greater than the long term ecological, social and economic
benefits of keeping the old growth intact. The history of British Columbia is a case of the former, not the latter. Expertise, legislation and political influence has focused on logging for maximum economic gain. Because the resource is publicly owned, the primary beneficiary’s of logging, the corporations, needed to develop rationale to convince the public that forest liquidation was in the public interest. This impacted on watershed management issues with the introduction of sustained yield theories, which were based on assumptions designed to meet economic objectives. This point was made by Jerry Franklin, one of the foremost experts on the structure and function of old growth forests, when he was asked about the impact of logging on water quality at a conference in Vancouver:

All the literature shows that in fact the natural forest in most cases produces the highest quality water. ...As you eliminate those forests, the quality of water would be increasingly at risk, although you might well be able to carry out most forestry practices without what you would call a significant reduction in water quality. So this is not a yes or no issue. It has to do with probabilities and it has to do with increments of change. ...Obviously the best risk for the watershed in terms of water quality is not to cut at all. But that can cost you a hell of lot of timber resource sometime, so you look for a middle ground. ...How much decrease in water quality or how much risk to water quality is a half a billion board feet of timber worth? Now that's a call your society is going to have to make (Franklin, 1990, pp. 22-3).

The debate over the management of the GVRD watersheds has not been framed by the GVWD as being one of values, in fact the GVWD has repeatedly expressed their belief that the issues are primarily technical and complex, and that science supports their management philosophy. They apparently fail to recognize the value system upon which their philosophy is based.

On the question of differing values in the GVRD watershed debate, the role ideology plays is to act as a filter through which evidence is either accumulated or ignored. Undoubtedly different conclusions are being drawn
from the same evidence. For example, while participating in a tour of the Capilano watershed with representatives of various interest groups, a forest worker commented on how great the recently thinned second growth forest looked. His comment was an expression of valuing the product of human management. To him, the forest he was admiring was akin to a manicured lawn, while to the environmentalists, the uncontrolled wildness of an old growth forests was the object of their rapture. Similarly, during the public hearings, an individual introducing himself as an artist spoke of finding the largest Pacific Yew trees on record in the watersheds. He spoke of their beauty and of the need for their preservation. The following speaker was the principal of one of the logging companies working in the watersheds. He commented on how the Pacific Yew is one of the ugliest trees in existence, and how rapidly they dull chainsaw blades. The values of these individuals have led them to reach conclusions which are neither right or wrong, they are simply different. However, to claim that the entire debate over watershed management is value driven is erroneous. While, as I have detailed, there are fundamental differences between the criteria proponents and opponents of GVWD management use to evaluate the evidence, there are claims, as I have also detailed, being made based on questionable assumptions and information. The forests are not in decline. Logging does not reduce the risk of fire, it increases it. The construction of roads produces sediment. Second growth forests are more vulnerable to disease, pest infestation and fire than old growth forests. The majority of research does a better job of supporting these claims than it does of supporting the GVWD's claims. In fact, support for GVWD claims comes more from an absence of the data needed to show the connection between their management activities and turbidity than it does from the presence of data showing no connection.
The GVWD management have repeatedly said that there is no evidence which shows a correlation between logging and sedimentation of the water supply, which leads them to the conclude that their management activities have no impact. The statement is, however, misleading: just because they have no evidence does not mean the correlation does not exist, it simply means they have no evidence. Criticisms directed at the management review pointed out that their data collection methodology was not designed to answer the question of whether or not logging and road construction was having an adverse impact on water quality, and consequently, they simply do not know one way or another. There is, however, no reason to believe that the results of research in numerous other watersheds which are similar in both physical structure and climate are not valid for the GVRD watersheds. The GVWD claims that their activities are conducted to the highest standards, standards which exceed the majority of logging operations, and are subsequently less at risk to failure. However, as the literature suggests, no matter how carefully a road is put in place and a forest clearcut, the hydrology of the "managed" areas is affected, as is, to some degree, water quality.

The issue is similar to the debate surrounding the health impact of smoking: while there are some scientific reports which do not conclusively show a correlation between disease and tobacco, the vast majority do show the link. Two quote only one example of each result leads to a false impression of there being some uncertainty. What has been consistently shown is that logging and road construction introduce greater amounts of sediment into a given watershed than would be introduced if no logging or road construction was taking place. Precisely how much more is impossible to predict. Jeffrey's (1968) research found examples of poor logging techniques producing negligible amounts of sediment; conversely, he found examples of exemplary logging
techniques producing a great deal of sediment. The difference in sediment production he attributed to the soil characteristics of each individual watershed. In other words, to log and build roads in a watershed supplying water—no matter how carefully it is done—is to introduce an element of risk to water quality. As Franklin said, the issue is whether we as a society value the economic benefit of logging more than we value the assurance old growth forests provide to water quality—and this value question has been obscured in the debate.

6.4 MEDIA COVERAGE

At the turn of the century the issue of logging in Capilano and Seymour watersheds was the focus of heated public and political debate. During the years 1905 and 1906, when the provincial government was issuing a new round of timber leases, and the Mayor of Vancouver was calling for the purchase of the Capilano Valley, the controversy between the municipal government and provincial government was reported on extensively in Vancouver’s daily newspapers.

With the creation of the GVWD and the cessation of all logging in the watersheds, media coverage focused on other infrastructure issues such as the construction of facilities and increases in the water rate. With a new administration in place in 1952, and a gradual transformation of management philosophy, there was no critical news coverage whatsoever. The single logging related story to make it to the front page of the newspaper from 1960 to 1988 promoted the benefits of logging the pest infested watershed forests (Vancouver Sun, December 13, 1969, p. 1). During this period the handful of stories that did report on watershed logging reported on it as a necessity, and a profit-maker for the GVRD.
With the renewed debate over watershed management, media coverage of the process relied on official sources. For the most part, GVWD staff maintained their role as the primary definer of the issue. During the first year of the debate, Wareing enjoyed the temporary status of defining the watershed management activities as being a threat to health. This status, however, went the way of his credibility.

The GVWD retained their role as primary definer of watershed management issues. An additional characteristic of the primary definers is a sound economic base (Gandy, 1980) from which they both initiate and respond to media coverage. With a limited amount of news space available, the primary definers are generally able to provide information to journalists more efficiently and consistently than most non-official sources, adding further advantage to their already privileged position. And as media institutions reorganize their operations to cope with fiscal constraint, there are fewer reporters on staff with each being asked to write more. With less time to devote to each story, there is even a greater reliance on readily available information. The media reorganization occurred during the same economic downturn which directed public concern and media coverage towards the recession, government deficit and unemployment, and away from environmental issues. The decline in public concern for environmental issues combined with a widespread mood of financial conservatism severely reduced both the membership and operating budget of environmental groups, further limiting their ability to maintain media relations.

The time scale the bureaucracies operate on conveniently eludes the time scale news media operate on. News is ill-equipped to cover slow developing phenomenon. In the case of the watershed management, the media cover key decisions, dramatic conflicts and official processes like public input meetings.
What the media fail to cover is the implementation (or non-implementation as the case may be) of the decisions themselves. This is where the advocacy groups have a key role to play. With an understanding of the issues, they are able to inform reporters about contentious management actions. In the absence of such advocates, key issues go unreported. This can clearly be seen in the lack of critical coverage between 1952 and 1988, and, to a lesser extent, can still be seen in the present. As one reporter interviewed for this study said, there was a lack of press releases coming across his desk. Without information he had little reason to believe the management activities represented a news story (Interview with Ben Parfitt, March 17, 1994).

Institutional routines impacted coverage of the watershed debate. During the public participation process the reporter sent by the Vancouver Sun had not previously written on the subject. As result of his limited familiarity with the subject, his coverage relied on the traditional sources, repeating their standard statements. For a reporter familiar with the issue, there were numerous new and credible sources offering different perspectives on the debate. The media—with the exception of one columnist—failed to cover these new sources.

According to a number of journalists working for the Sun, the editorial staff simply did not think the story was of interest and allotted neither time or space to reporters pursuing it. This in turn influenced reporters who were free to choose their own stories, knowing that if they pursued the watershed issue it would likely be buried in the back pages of the paper. This helps to explain why only 94 stories were written on the debate over a five year period from 1988 to 1992, with only three of these stories appearing on page A1, and six appearing on page B1. The majority of news coverage that did make it in the paper was written by a reporter whose beat covered all aspects of the GVRD, from air quality to development, from municipal taxes to water quality. Restricted in the
amount of research that could be conducted, he consequently had little, if any, means of evaluating statements pertaining to expert disagreement. As he explained, a typical day saw him attending GVRD meetings in the morning, returning to his office by 1:00pm and filing the completed story by 5:00 pm (Interview with Harold Munro, October 19, 1994). According to the reporter, "there is a pile of documents which supports one position and a pile of documents which supports the other. I'm not qualified to judge them, so I report on both perspectives." With the breadth of his beat, and the limited amount of time his organizational routine allowed for each story, he had little recourse but to rely on official sources and readily identifiable voices of opposition. Without the means to evaluate scientific claims, as Singer and Endreny (1993) found, the quoting of divergent opinions can lead to an inaccurate impression of evidence available. I believe this has had a significant influence on public perception of the issue because the consistent, yet inaccurate, claims by the GVWD that logging helps prevent catastrophic fire have not been set in the context of existing knowledge.
CHAPTER VII.
SUMMARY & CONCLUSIONS

As this thesis has shown, there have been cycles of controversy surrounding logging in Vancouver's watersheds since the turn of the century. During the twenties, concern over the issue generated extensive press coverage and a heated political debate. The result was sufficient political pressure to force the provincial government’s Forest Branch to relinquish control of the watershed lands to a municipal agency. With the creation of the GVWD in 1926, the agency's watershed management policies called for the end of logging, an objective achieved by 1936. During the late 1940's and early 1950's, the forest industry, the provincial government and the Forest Branch promoted a forest management approach based on a theory called "sustained yield." Skillful lobbying in the mid-1950's influenced the GVWD management to adopt the sustained yield model for the watersheds, justifying it as a necessary means for maintaining water quality. But close examination of the development of the theory reveals that it was less a result of advances in the science of watershed management, than a model of industrial efficiency in forest management. Using this rationale, the GVWD proceeded to log in the watersheds without opposition.

In 1988, riding a tide of environmentalist concern, the WCWC, an environmental advocacy group, challenged the GVWD's watershed logging. The group's claim that logging was threatening water quality succeeded in entering into the media's coverage of the subject. This in turn renewed the debate over watershed management. In response to this challenge, GVWD initiated a public participation process to elicit comments on a review of their
watershed policies and practices. The WCWC and other critics of the watershed logging used the public participation process as an opportunity to present their alternative scientific views concerning forest ecology and hydrology. While the review recommended dropping sustained yield management, the assumptions underlying the approach were retained, including the need for preventative logging. Like many other cases of public participation in environmental assessment, the GVWD's review appears little more than a management technique for channeling criticism.

One of the reasons why WCWC's challenge to watershed logging did not achieve its objective is that the controversial issues they raised received limited treatment in the press. In keeping with a well documented pattern, news coverage of the watershed management debate relied on official sources: the politicians, the bureaucrats, the industry experts. The complex scientific arguments raised in the public participation process and dismissed by the GVWD were virtually ignored by the news media, which relied extensively on the GVWD position to frame the debate. Analysis of the coverage shows that the media portrayed the criticism of the management program as coming primarily from an environmental group "discredited" by an inaccurate claim made early in the debate. This contrasted with the GVWD's credibility, which was bolstered by the support of their expertise, the backing of legislation, and the "legitimation" of the public participation process. The media's editorial staff did not grant sufficient significance to the debate between WCWC and GVWD positions or assign sufficient resources to the story. As a result, reporters had neither the time or motivation to investigate the debate over watershed management science.

What this case study has shown is how watershed management science has been narrowly defined by the GVWD in accordance with industrial forestry
practices. The case study has also shown how GVWD watershed research has remained within the assumptions defined by the industry complex. This is a key point because with control of the research agenda, studies which could show a direct relationship between GVWD watershed management activities and sedimentation of the water supply were simply not conducted. By looking at the recent debates over GVWD watershed management, it is clear how critical and informed scientific arguments challenging the GVWD have been constrained by a management decision making process designed as a forum for public input. This study has also shown that media, with a predisposition for the official version of watershed management, have failed—with few exceptions—to report on these same critical arguments. Why is an understanding of this important? From reviewing the news coverage during the important period leading up to the creation of the GVWD, I believe the debate over watershed management was fueled by the extensive media coverage. This leads me to speculate that the electorate's present tacit acceptance of existing watershed policies—as indicated by the lack of opposition to them—is the result of limited exposure to the substantive criticisms. I concur with Marchak’s observation that "While public opinion may permit any specific legislation, one is ill-advised to attribute government action the legitimation of 'majority' support when support takes the form of apathy" (1988, p. 31). I also concur with her speculation that "the mass media have not created a climate of debate by informed citizens" (Marchak, 1988, p. 31).

My analysis of this issue leads me to believe the current management practices have more to do with maintaining the economic interests of the forest industry than they do with maintaining water quality. The weight of the evidence contradicting the GVWD's assertions makes this clear to me. Given that the financial and health risks are borne by residents of the region, acceptance
of this arrangement is a profound failure on the part of the municipal government to safeguard their constituents' interests. Another failure is that of the news media in their coverage of the debate. The coverage, being neither extensive or critical, is the result of institutional constraints and norms. Just as Jeffrey challenged the wisdom of expecting the forest industry to manage a variety of resources for the benefit of society, so too do I question the wisdom of expecting that commercial media, an industry constrained by its economic objectives, provide the information necessary for informed debate. As Jeffrey said of the forest industry, the same can be said of media: "Ways have to be found to ensure coincidence of corporate and public interests" (1968, p. 10).

I opened my discussion of this issue with reference to British Columbia's increasing population and the associated strain on natural resources. Without informed public debate over the increasingly complex resource management decisions which need to be made, it seems likely that policies established to ensure narrowly defined economic objectives will remain in place. As this study suggests, with government policy favoring industrial interests, the onus for generating informed public debate lies elsewhere. This thesis has shown how environmental activism, public participation in resource management decisions and media failed to generate this debate. The strategies of the advocates, the structure of the participation process and the limitations on media's coverage of the scientific issues are central to this failure. It is my hope that the specifics of this case study will inform the investigations of other researchers as they address these issues.
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